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A TECHNOLOGICAL ANALYSIS OF LAKE ABITIBI BIFACES

by

Ⓒ John William Pollock

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
DOCTOR OF PHILOSOPHY

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External Examiner

Date June 11, 1984

DEDICATION

In recognition of their years of continuing archaeological research on Lake Abitibi and their friendship, advice and helpful aids, this dissertation is respectfully dedicated to Marjorie M. Jordan and Justin C. Jordan.

ABSTRACT

The major purpose of this thesis is to extend beyond the traditional boundaries of stone tool analysis to explore a new theory and method of lithic analysis. The search for new methods and theories of lithic analysis has been somewhat neglected by archaeologists in recent years. The method utilized and developed here is a cognitive based experimental approach. Modern lithic craftsmen, through controlled experiments, are used to define the specific attributes and morphology produced by a unique behavior unit (i.e., substantial percussion thin with billet) on an individual experimental flake scar or series of scars. These morphological units then, serve as a reference collection which is used to help interpret the behavior responsible for the morphology of prehistoric stone tools.

Not only are the specific behavior units used to manufacture the prehistoric specimens reconstructed, but the purpose and sequencing of these units are inferred. It is this sequencing of specific production units which we feel is closely tied to the cultural context in which the artifact was produced. Manufacturing techniques tend to be culture related as flintknapping skills require a lengthy apprenticeship and learning period. Studies of modern craftsmen have also confirmed that once a certain method of stone tool making and problem solving is learned with their associated motor movements, craftsmen tend to follow this learned pattern or repertoire quite closely. Thus, it is entirely possible that techniques and sequencing of techniques used in producing stone tools is much more culture specific than shape or size considerations used in more traditional lithic analysis.

The prehistoric stone tools analyzed in the thesis are from two archaic sites on Lake Abitibi in northeastern Ontario. The study area straddles the Ontario/Quebec border and lies on the edge of the James Bay/Hudson's Bay lowlands. The analysis used is deemed to be particularly suited to these sites which, due to erosion and high water levels, lack much of the normal data found on archaeological sites such as stratigraphy and faunal remains. This lack of other standard archaeological data therefore places a greater burden on the stone tool analysis to produce meaningful culture historical information.

The results of the cognitive processual analysis employed here has produced such information in that the sites have been shown to be technologically independent, therefore indicating the presence of two different archaic groups. It has also demonstrated that one site, the Jordan site, thought to be, perhaps, multicomponent due to the presence of extremely large bifaces, is not multicomponent. The large bifaces have been shown to be manufactured by the same techniques and by the same sequence or process as the smaller bifaces at the site. This suggests that size alone is not a good basis upon which to base a stone tool typology.

In regards to shape typology, three specimens from each of the two sites have very similar shape and size (metric) attributes. The technological analysis, however, indicates that despite the same shape and size, the bifaces from each of the two sites can be clearly distinguished on the basis of how they were made. Thus, a technological analysis allows us to see similarities and differences among artifacts in a way that would be impossible if a more traditional approach were used. This is significant in that the reconstruction of culture history is only as good as the data typologies which underlie it. It is to this question of typological adequacy that this present thesis is addressed.

ACKNOWLEDGEMENTS

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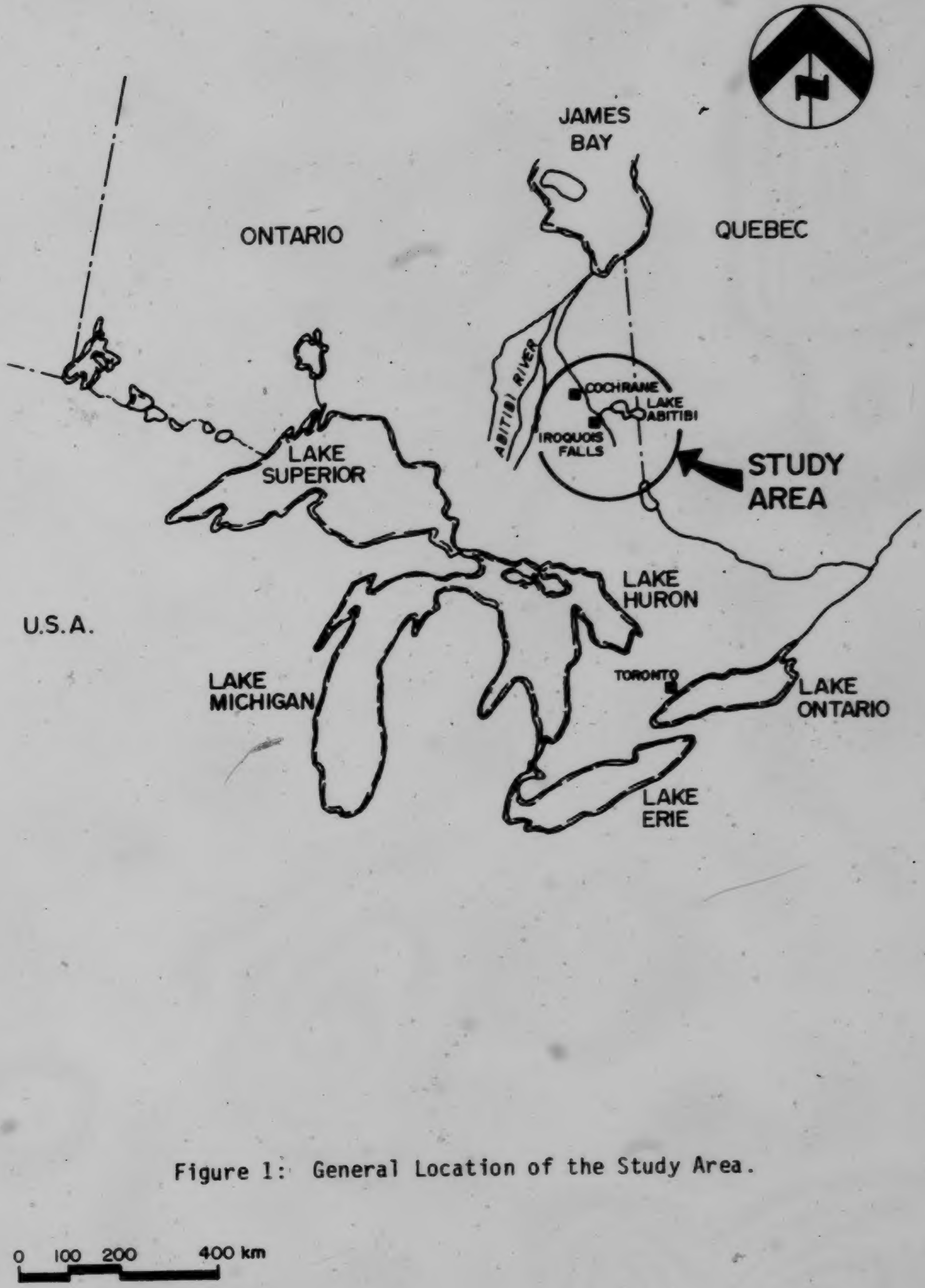
CHAPTER I

THEORY

General Introduction

The purpose of this dissertation is to analyze two prehistoric campsites and a quarry site in the boreal forest region of northeastern Canada in order to delineate technological variation in lithic manufacturing techniques (Figure 1). This procedure should allow analytical separation of these sites in order to resolve several basic archaeological problems suggested by the work of previous area researchers such as Ridley (1956, 1958, 1966), Lee (1965, 1974), Wright (1972d), Pollock (1975c, 1976), Knight (1977), Marois (1975), and Kritsch-Armstrong (1982). Common to all previous work and endemic to the boreal forest region is the problem of mixed assemblages of artifacts deposited on the surface or in a shallow soil matrix with little or no physical stratigraphy. This situation is largely due to the slow rate of soil deposition and formation, massive forest fires which destroy organic matter in the soil, and a concentration of overlapping occupations in favorable micro-environmental areas (or eco-zones).

Previous researchers (Ridley, Knight, Pollock, above) have utilized a chronicling approach which attempted to produce a continuous and detailed cultural chronology for the area. For the purpose of this


JAMES BAY
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LAKE ABITIBI
IROQUOIS FALLS
STUDY AREA
LAKE SUPERIOR
LAKE HURON
U.S.A.
LAKE MICHIGAN
TORONTO
LAKE ONTARIO
LAKE ERIE
0 100 200 400 km

Figure 1: General Location of the Study Area.

dissertation all previous work done in this area of the Boreal Forest can be subsumed under what is generally called the culture-historical paradigm. Furthermore, it should be pointed out that because the ultimate goal of this research is to discover the evolution and variations of human adaptations in the Boreal Forest, this dissertation also has culture history as one of its primary objectives.

Before proceeding, a brief description of the three prehistoric archaeological sites forming the basis of this thesis is in order. The three sites, all located on Lake Abitibi, Ontario, are the Jordan Site (DeHa-8), the Jessup Site (DdGw-2), and the Mount Goldsmith Quarry Site (DdGw-3) located near the Jessup Site.

The Jordan Site, first located in 1973 by Justin and Marjorie Jordan, was surface collected by them during the years 1973, 1974 and 1975. As the site has since been continuously inundated by water it may now have been severely impacted or destroyed by the continuing high water levels and storms. When I visited the site in 1979 it was under water. Extensive subsurface testing of all above water areas near the site failed to produce any cultural materials. The majority of the archaeological specimens, including the important large bifaces, came from a 2 x 2 m cache area. The remaining materials were spread over a 70-metre length of low clay shoreline overlaid by a thin layer of water deposited sand. Flaked materials and numerous fire broken rocks were found among the larger boulders present on the shoreline (Jordan, Jordan and Crockatt 1976:17).

The Jessup Site (DdGw-2) was recorded by Marjorie Jordan, who also recorded and collected materials from the site in 1977. The 1977 investigations revealed the site to be of potential importance for the prehistory of the entire Canadian Boreal Forest. The site is at least 2.5 km long, spread out along a shoreline which varies from a low clay beach with a thin sand covering, to rocky outcrops separated by steep varved clay banks with narrow sandy beaches. A great deal of archaeological materials have been exposed by at least 30 metres of wave cut erosion. The beaches are covered with artifacts, mainly cores, flakes, and biface preforms or rough outs (Jordan & Jordan 1977). The writer first visited the site during 1979 at which time Ingrid Kritsch-Armstrong, as part of her M.A. studies at McMaster University, conducted some excavations at one of the higher terrace localities on the site (Kritsch-Armstrong 1980, 1982). Her excavations of 29 square metres produced over 100,000 flakes in a 6-8 cm layer, amply demonstrating the quarry-workshop nature of the site. However, the actual bedrock quarry and lithic raw material collecting site (as opposed to the Jessup workshop site), although suspected by Kritsch-Armstrong and myself to be nearby, was not located until the following year. During 1980, the writer, accompanied by Larry Jensen, a geologist with the Ontario Division of Mines (who has worked in the area since 1972), did locate the geological formation supplying the lithic raw material, and one bedrock quarry and collecting locale on nearby Mt. Goldsmith called the Mt. Goldsmith Quarry Site (DdGw-3).

All of the prehistoric artifacts under study from the Jordan Site were collected by Mr. and Mrs. Justin C. Jordan of Iroquois Falls, Ontario. They have also kindly loaned the writer a portion of their collection from the Jessup Site which, along with materials collected by the writer in 1979 and 1982, comprise the prehistoric artifact sample from the site used in this dissertation. Additional materials not used in this thesis were collected by Ingrid Kritsch-Armstrong and analyzed in her Master's thesis (Kritsch-Armstrong 1982). As well, some artifacts from the site were analyzed by Thor Conway (Conway 1978) although he did not visit the site.

During September 1982, I undertook some excavations and mapping at the Mount Goldsmith Quarry Site. Details are presented in section 4.3 of this thesis.

Dating (of the above sites) remains a problem (Table 1). Unfortunately the 1979 fieldwork failed to date the early archaic component at the Jessup Site. It should be noted that while both the Jessup and Jordan sites contain primarily pre-ceramic Archaic or earlier materials, a Middle Woodland component is also suspected at Jordan and known for at least a portion of the Jessup Site (see Table 1) (Kritsch-Armstrong 1982:214). Previous work by various researchers in the Boreal Forest regions of Canada has outlined a number of continent-wide problems expressed by Wright (1972d) as hypotheses which require testing:

(1) The Shield Archaic was a cultural tradition that evolved from a late Paleo-Indian or Plano tradition cultural base in the eastern Northwest Territories and probably the northwestern portions of the Boreal Forest - Canadian Shield (Wright 1972d:3). Thus, there was a cultural continuum from late Paleo-Indian into Shield Archaic.

(2) Plant and animal reoccupation of land freed by the retreating Laurentide ice permitted early northwestern Plano-Shield Archaic hunters to expand their territory particularly in an easterly direction into the Lake Abitibi area (Wright 1972d:4).

(3) The relationship between the Shield Archaic and adjacent contemporaneous populations appears to have been both relatively limited

Table 1. Cultural Chronology of Northeastern Ontario

Time	Tradition	Phase	Component (Site)
1300 A.D. - 1650 A.D.	Northern Algonquin (Terminal Woodland)	Ghost River	Ghost River Louis
800 A.D. - 1300 A.D.	Northern Algonquin (Terminal Woodland)	Duncan	Duncan Larder Lake (A)
1400 A.D. - 1650 A.D.	Moose R. Cree (Terminal Woodland)	Valentine	Duck Bay Valentine
1200 A.D. - 1400 A.D.	Moose R. Cree (Terminal Woodland)	Phipp's	Phipp's
1400 A.D. - 1650 A.D.	Blackduck (Terminal Woodland)	Sandbar	Sandbar Snake Arm Site
600 A.D. - 1400 A.D.	Blackduck (Terminal Woodland)	Snake Arm	Snake Arm Site
200 B.C. - 400 A.D.	Laurel (Initial and Middle Woodland)	Eastern Laurel	Larder Lake (B) Fretz Montreal River Jessup
200 B.C. - 1000 B.C.	Late Shield Archaic	Mattawan	Smoothwater Mattawan
1000 B.C. - 2000 B.C.	Early Shield Archaic	Abitibi Narrows	Larder Lake (C) Fretz Abitibi Narrows Jessup
2000 B.C. - 3000 B.C.			Riordan Montreal River
unknown	poss. Late Paleo or early undefined archaic	not defined	Jordan

(based on Pollock 1975c:29)

and insignificant in terms of cultural innovation (Wright 1972d:5).

Wright's underlying assumption pertaining to his hypotheses and suggestions is that the above named cultural traditions are prehistoric populations recognizable by defined flake stone artifact types and assemblages. Wright, in his monograph on the subject, "The Shield Archaic" (1972d), utilized a normative approach based on the relative frequency of artifact classes for eleven separate sites (frequency of projectile point varieties, frequencies of large and small scraper varieties, and some technological attributes such as grinding).

Dean Knight's (1977) doctoral dissertation on "The Montreal River and the Shield Archaic," involved a study area immediately south of the Lake Abitibi area. Knight based his thesis on the assumption that cultural adaptations to the environment are patterned behavior and that an evolution of patterned behavior is recognizably reflected in the artifacts (Knight 1977:5). The three major research problems of Knight's thesis were:

> (4) What is the nature of the Archaic occupations of the region; and can these occupations be subsumed under the umbrella term "Shield Archaic"?
>
> (5) Given the fact that there are two or more Archaic phases represented in the area, can reasons be suggested to explain similarities and differences?
>
> (6) Are there cultural dynamics which can explain the noticeable changes in a region through time? Are these changes really changes or is there a cultural continuum between 3000 B.C. and 180 B.C.?
>
> (Knight 1977:6)

Knight found it difficult to solve any of the above questions utilizing standard shape and metric analysis of artifacts. This difficulty clearly points out the limitations of the data obtained from previous analyses of prehistoric materials from Boreal Forest archaeological sites, and suggests the need to squeeze further information from a meagre source.

In her 1982 thesis concerning the Jessup Site, Ingrid Kritsch-Armstrong addressed ten specific questions related to her excavation of a portion of the Jessup Site. These involved questions concerning the prehistoric environmental conditions, the source of raw lithic materials and the manufacturing methods and types of tools being produced, at the site. Other questions concerned the nature and seasonality of the site as well as the cultural identification of the site's inhabitants and a comparison to other regional sites (Kritsch-Armstrong 1982:24-5). In her conclusion she states that,

> The Jessup Site was utilized as a lithic workshop and habitation site by Archaic and Laurel peoples over a period of approximately 3000 years. The major attraction to this site was the availability of raw material from nearby sources as shown by the abundance of local raw material in the form of chipping detritus, unfinished tools, broken tools and cores.
> (Kritsch-Armstrong 1982:258)

All previous attempts to solve basic questions such as those outlined by Wright, Knight, and Kritsch-Armstrong have had to contend with problems with the archaeological data base, and the results have been less conclusive than the resolutions obtained in many other prehistoric areas of North America.

In order to compensate for the methodological and data recovery limitations inherent in Boreal Forest archaeology and especially the sites under consideration here, I have applied another approach in order to produce a technologically based lithic typology which is appropriate given the limitations inherent in the data base. The study of variation in lithic production and manufacturing techniques derived from an experimental cognitive approach utilized here is described at length in the theoretical and methodological section of this chapter.

Previous workers concluded that the initial occupation was by Shield Archaic peoples who first occupied the area about 4000 years ago (Pollock 1975, 1976:192; Ridley 1966:4). Although possible, no concrete evidence of actual occupations had been found for Laurentian Archaic (4000 B.C. - 3000 B.C.) or Northern Plano occupations (6000 B.C. - 4000 B.C.).

As a result of these initial archaeological works, several possible chronologies (for a listing see Kritsch-Armstrong 1982:5) and problems as outlined above and in Table 1 were identified. However, the research was clearly at a low level of explanation concerning general anthropological/archaeological concerns including economy, subsistence, and technology. The general artifact classification scheme being used by Wright, Dean Knight, this writer's previous work, and to a lesser extent by Kritsch-Armstrong, was based upon a mixture of shape and assumed functional classes (such as scrapers), and limited metric attributes. Analyzing the attributes utilized a normative approach in that central tendencies were sought in order to segregate artifact "tool kits" (Binford & Binford 1966) and to isolate the lithic artifacts presumably pertaining to specific cultural groups. This approach created real problems, however, because the apparent archaeological assemblages found in the area are not characterized by similarities but by a tremendous diversity of projectile point stylistic forms, raw materials, and a paucity of clear-cut functional classes. Such a situation, with little or no radiocarbon or stratigraphic dating controls, tends to lead to the assumption that the apparent assemblages must have been mixed or are multi-component. Another problem is that

Wright and other researchers (e.g., Dawson 1975) see the Boreal Forest as an area of environmental sameness and postulate that archaeological assemblages reflect this feature by exhibiting broad spatial, temporal, and cultural homogeneity. It was the writer's contention however, after examining the data and conducting research in the region, that cultural variability was present with a number of regionalized cultures located within macro-topographical features such as major river valleys and having slightly differing geographic/ecological environmental zones (Pollock 1975c).

One of the "cultures" around which much debate has centered is the Shield Archaic Tradition (see Hanna 1980:65 for a summary). The debate concerning the Shield Archaic was recently revived by A. P. Buchner (1979:a, b) who makes many of my points above concerning limitations of the boreal forest archaeological data base and suggests that "the comparison of relative frequencies of artifact classes is of little or no utility in distinguishing and/or defining broad cultural traditions" (Buchner 1979:9). He further points out the high degree of artifact variation found on Boreal Forest sites. In regard to shape typological relationships, Buchner points out that, "Closer typological relationships are found with archaic sites outside of the Shield than among most of those which have been attributed to the Shield Archaic Tradition" (Buchner 1979a:7).

In her assessment of the Shield Archaic, Hanna (1980) pointed out that Wright's original 1972 definition of the complex was lacking "methodological validity." This was because the seriation used by Wright to define his artifact category variation was not based on comparable temporal components and the artifact classes used could not be assessed as to their temporal or cultural significance and/or applicability to a single cultural tradition. Further, the sites were from too wide a geographical area and spatial variation was not allowed for despite the fact that a vast geographical area was involved.

Hanna (1980:71-2) also discussed Wright's (1972d) contention that it is the technology of the Shield Archaic that separates it from other archaic traditions. She feels that, "for the majority of the artifact classes discussed, Wright does not demonstrate that their method of manufacture is significantly different from that of other archaic complexes." Of importance to this thesis is Hanna's contention that a "reliance on a percussion technology may be the common technology that binds the diverse regional complexes lumped into the Shield Archaic" (Hanna 1980:72).

The writer believes that one's cultural reconstructions are no better than the taxonomic scheme utilized for handling the data. By adapting aspects of cognitive anthropology to experimental lithic studies, and using the resulting attribute data to study variation in prehistoric archaeological lithics we are building a new typology in a new direction without losing any of the gains made in the past.

Part Two: Specific Hypothesis and Questions of this Thesis

A specific hypothesis and related questions are examined here in order to explain the Lake Abitibi lithic remains in light of the experimentally based flake scar morphology typology used in this thesis. The study of a particular prehistoric lithic manufacturing technology/typology (which may be related to a specific cultural group) can be advanced by first conducting experiments by a modern lithic craftsman utilizing similar raw lithic materials to produce a series of flake scar morphologies on experimental specimens. In this way, the exact manufacturing or technological input is known. Too, once the technology (function, extent of effect, behavior type and tool used) and resulting morphology represented on the flake scars are known for a particular lithic material, it is possible for the prehistoric archaeological artifacts to be analyzed in terms of technologically specific flake scar morphological attributes. It follows then, that this data combined with standard archaeological information (subsistence, settlement pattern, stratigraphy, etc.) can help in the resolution of culture/historical hypotheses and questions.

The method is deemed particularly useful for single-component or suspected multi-component archaeological areas or sites where lithic remains predominate and/or there is poor archaeological data on stratigraphy, within site artifact provenience, etc. Some forms of ploughed surface sites, flooded sites, disturbed sites and many sites in the Boreal Forest regions fit these conditions.

Hypothesis: By creating a technologically based typology (as opposed to an outline shape/size typology) utilizing bifaces from the two site collections, it can be demonstrated that there are technological differences between the Jessup site and the Jordan site artifacts which reflect real differences in the production strategies and manufacturing techniques employed. Specific questions associated with this hypothesis are as follows:

(1) What is the technological significance of the extremely large bifaces from the Jordan site? Are they part of the same technological assemblage as the smaller bifaces found on the same site or do they represent a different manufacturing technique?

(2) Is there any technological evidence to support the assumption that the Jessup site (DdGw-2) is presumed to be a lithic manufacturing or workshop site for the production of biface roughouts or preforms?

(3) Are the biface manufacturing technologies represented at the two sites essentially similar or are they different? Are the similarities close enough to suggest only one cultural group (a specific linguistic-biological population) is represented by the two sites or are there sufficient differences to postulate that two different cultural groups were involved?

It should be noted that because this is a new typology and represents an initial application of the method to prehistoric materials, the sites here are "type" sites and as such there is not at present any body of comparative data which would allow us to answer at this time any definitive questions concerning the Jessup and Jordan sites' relationship to other sites in the Shield Archaic Tradition or their relationship to preceding or succeeding cultural groups. Some non-technological comparisons are however, made in Chapter IV, Part Four of the thesis. However, there are two broad questions arising from this thesis which can be addressed, to some extent, by the data available. These are:

(4) Is there any evidence from this thesis to support Hanna's (1980: 71-2) suggestions that a very heavy reliance on percussion technology may be characteristic of the Shield Archaic and be the common technology that links the regional phases into a tradition?

(5) In regards to the Mt. Goldsmith Quarry site, what are the major methods of raw lithic extraction used? Is the lack of a lithic workshop and finished stone tools at the quarry itself an unusual occurrence or is this common for sites of this type?

Part Three: Theoretical Discussion

It is somewhat obvious from the previous discussions that, in the Boreal Forest at least, the standard approaches utilized in the analysis of lithic materials, while allowing for creation of a basic cultural chronological sequence, have not been overly successful in answering many of the broader anthropological questions regarding the evolution and adaptation of prehistoric cultures. What is clearly needed is a way to build in a new direction while using what has been done previously in the area. I believe that the study of lithic manufacturing technology offers such a way. Before discussing this approach derived from cognitive anthropology however, other relevant theoretical approaches, particularly the normative, culture historical and systems approaches, should be discussed in regard to their adequacy in handling the classification of stone artifacts. Especially in dealing with sites such as those in the Boreal Forest where contextual information is often minimal, classification of the lithic remains are "of necessity the foundation of data analysis . . . as it is largely on the basis of the classification of the data — that inferences are made" (Read 1974:216).

Because all theoretical approaches in archaeology are ultimately dependent on artifact typology, let us begin with a brief review of earlier concerns with typology. Krieger (1944) states that "ideally, an archaeological type should represent a unit of cultural practice equivalent to the culture trait of ethnography." Krieger goes on to discuss procedures, types, subtypes, classification schemes, and application of the formal typological method based primarily on shape. In the conclusion of the paper, Krieger states that:

> 1. Arrangement for descriptive orderliness and symmetry is equivalent to analysis for the discovery of cultural relationships.
> 2. Any grouping in a classifactory outline is automatically a type.
> 3. There are basic characters underlying the products of human workmanship which, if they can be discovered, will provide the means for more uniform and standardized classifications.
>
> (Krieger 1944:28)

Other attempts to deal with typology include "mode" analysis (Rouse 1960), "attribute analysis" (Spaulding 1953; 1960), classification of artifacts in terms of production stages, and the concept of the "tool kit" (Binford & Binford 1966). Tool kits were constructed by "the use of factor analysis carried out on a matrix of correlation coefficients calculated between various pairs of tool types using data on the relative abundance of tools within assemblages" (Ammerman and Feldman 1974:610). Put more concisely, the aim was to isolate groups of tools utilized for a common function (such as hide working). Still other methods involve looking for assemblage-types and artifact-types as outlined by Desmond Collins (1970). Such types are identified by "constantly recurrent traits."

With this brief background on the development of typology in archaeology, let us turn to a consideration of how data retrieved from artifacts has been used to reconstruct the larger picture, examining first the culture-historical approach. The culture-historical approach grew out of the association by North American archaeologists with departments of anthropology and was thus heavily influenced by ethnology (Flannery 1972:100). Like early ethnologists, archaeologists were concerned with material culture and the description of space-time cultural sequences. This early and important paradigm was based on the concept of culture as a body of shared ideas, and research was aimed at discovering the norms for each culture.

Although the culture-historical approach was successful in regards to analysis of such processes as diffusion, parallel and in situ cultural development, as well as establishing chronological sequences, in the writer's opinion the approach suffers from certain limitations. First, judgmental assessments of the data base sometimes flow from an ethnocentric world view of the particular archaeologist. In other words, judgments are often highly subjective and procedures poorly spelled out. Second, while the majority of conclusions of culture-historical research may be valid, some aspects of material culture such as manufacturing technology have not been dealt with in depth. Rather than an emphasis on manufacturing techniques, the approach has relied heavily on "stylistic" (shape) considerations. Third, the culture-historical approach has lacked a dynamic capacity to handle variation due to its reliance on a normative approach. The normative approach has been described for archaeology by Binford (1965). In his view the normative approach has led to the dependence on index fossils (e.g., projectile points) and a focus on diagnostic artifacts in order to construct cultural chronological sequences within a geographical and temporal framework. Because a normative view of the universe allows one to organize and describe large amounts of data, it is productive. It has, however, created a picture of assemblage uniformity by focusing on central tendencies. Finally, as mentioned in the early pages of this chapter, the culture-historical approach often ends with a chronicle of unique events rather than leading to the isolation of general cultural adaptations such as changes in lithic manufacturing techniques.

The processual or systems approach, generally known as "The New

Archaeology," is, at least in part, a response to the culture-historical approach. Many different scientific methods under this banner have been tried by researchers in an attempt to generate scientific explanations or 'covering laws' for archaeology (Watson et al. 1971; but see critique by Morgan 1973). The main initiator of this paradigm was Lewis R. Binford (1972), following the anthropologist Leslie White, who views culture as an "extra-somatic adaptive system . . . employed in the integration of a society with its environment and with other sociocultural systems" (Binford 1965:205). In a functionalist manner the approach sees society (and prehistoric cultures) as a number of subsystems including not only cultural subsystems such as religion, language, trade, technology, etc., but also interrelated environmental subsystems such as geology, flora, fauna, climate, etc., all maintained within an equilibrium. Theoretically, all the components of the system can be studied as variables in precise relationships to one another (Dumont 1975:7, 8). In contrast to the normative view, a systems approach to culture holds that variability in artifact styles is associated and correlated with specific social groups and their concurrent environmental settings, with no precise relationships to time and space. That is, a great deal of variability could be contained within one cultural group in a short time frame due to factors such as subsistence shifts.

Many researchers studying variation in lithic assemblages have used a number of models such as the Hempel-Oppenheim model of deductive-nomological explanation (Fritz and Plog 1970), or R-mode analysis which can be expressed as statistical or mathematical models aimed toward the goal of obtaining 'covering laws.' Although a great deal of work has been expended to date, few "laws" relating to prehistoric cultures have been discovered and it would appear that other than the promotion of significant inter-disciplinary studies and the increased awareness of the need for greater environmental, subsistence, and raw material procurement data, etc., the systems approach school has exhausted some of its more aspiring goals and techniques (Thomas 1978:23).

In regard to my Boreal Forest data, the emphasis of the systems school on subsistence and within-site distribution, and their concern with mathematical models involving large numbers of attributes, does not seem suitable for my purposes. Not only are excavated contexts lacking for the Boreal Forest materials, but subsistence and other subsystem data are non-existent. The lithic studies conducted under the systems paradigm appear to be based on a large number of metrical and technological attributes, few of which can be clearly defined as being of significance. Indeed, it is seldom clear what specific attributes such as artifact length or edge angle actually represents in terms of the technology used by a specific prehistoric group.

The writer believes that artifact based reconstruction of past cultures is no better than the typology for handling the data. Given that the culture-historical and systems approaches may have reached close to the limits of their productivity, there is a need to try a new approach to lithic studies. Such a way is provided by the cognitive approach upon which this thesis is based.

Part Four: The Cognitive Approach to Prehistoric Artifact Analysis

Several years ago David Young (cognitive anthropologist) and Robson Bonnichsen (archaeologist and lithic technologist) came to the conclusion that it was essential for anthropologists to begin an active search for common ground between cultural anthropology and archaeology.

This research concerning stone tools, which has now been in progress for several years, has concentrated on working with living craftsmen in order to understand how a craftsman uses his knowledge and skills to solve specific production problems, and how his decisions are reflected in the morphology of the finished artifact. The method involves videotaping the entire production process and eliciting information about the range of alternative solutions to technological problems perceived by the craftsman, his reasons for choosing specific alternatives over others, and how he translates these decisions into behavior by the application of different kinds of force to the material. Using this kind of information, it becomes possible to study the relations, for example, between particular flaking behavior and resulting morphological attributes on experimental artifacts. Knowledge of such technological cause and effect relations (i.e., relating "dynamic processes" to "static patterns") not only preserves vital information on dying crafts but provides analogues for the classification and interpretation of prehistoric artifacts in terms of manufacturing procedures, rather than on the basis of outline shape and/or technological attributes whose meaning and significance may be undemonstrated.

Previous to this research, the cognitively derived experimental lithic approach has been applied only in a very preliminary fashion to the analysis of artifact assemblages from the Cypress Hills of Alberta, the Munsungun Lake area of Maine, and the Pryor Mountains of Montana (David Young: personal communication). Several students are currently applying this analytical approach to a variety of prehistoric data. The theoretical foundations of the cognitive approach have been presented in several unpublished papers by Young and Bonnichsen, and in a 1984 monograph, 'Understanding Stone Tools: A Cognitive Approach.' Also of interest is Bonnichsen's Ph.D. dissertation (1977). The cognitive approach to lithic analysis offers a methodology for the analysis of each individual artifact, and provides a way to describe meaningful variation; most importantly it allows one to study differences as well as similarities in an artifact assemblage.

By utilizing an experimental approach, the method demonstrates the nature of the connection between decisions, behavior and resulting morphological attributes. It is important to stress that the cognitive approach offers a dynamic process approach to typology. It does not simply add a new series of attributes for archaeologists to analyze. Arbitrary selection of attributes and the statistical manipulation of such attributes are useless from the beginning if one does not understand precisely how that attribute was formed on the stone tool, and more importantly, the overall relationships to other attributes. The cognitive approach offers a way of developing a better typology based on processual analogues. The typology developed is based upon a series of attributes grounded in the observation of craftsman's production processes not found in shape or earlier attribute typologies. The main reason this kind of approach has not been tried before is because aboriginal flintknappers are no longer available for observation in North America, and until recently there was also lack of modern flintknappers from which to develop analogues. That is, the real basis of the cognitive approach in regard to lithic studies is the study of the 'behavior behind the attribute' within a strictly controlled experimental situation (in lieu of ethnographic or ethnoarchaeological observation). The use of modern craftsmen to replicate prehistoric technology allows one, where the technological input is known (e.g., billet percussion flaking on a specific material), to describe the resulting flake scar attributes. This is quite different from a purely intuitive or essentially arbitrary attribute selection process.

The cognitive approach as it applies to the study of prehistoric technology can now be examined in detail. The approach consists of the following major components:

A. Basic Process Studies
   1. Studying how living craftsmen use their production codes to generate specific production strategies and how these strategies are translated into behavior.
   2. Studying the kind of morphology unit, (such as a flake scar) that is produced on an artifact by the application of a specific kind of "behavior unit" (e.g., hard hammer percussion).

B. Classification of Prehistoric Artifacts
   1. Using process analogues developed in basic process studies to analyze individual prehistoric artifacts in terms of the behavior units responsible for the morphology exhibited by flake scars.
   2. Constructing artifact techno-types in terms of similarities and

differences in manufacturing technology.

C. Archaeological Reconstruction

This involves an assessment of artifact types in terms of variation in lithic production strategies plus related archaeological data, and resolving problems such as whether technotypes reflect different cultural traditions or varying adaptive strategies within a single tradition. This stage involves intuitive and subjective evaluations of the data; however the basis for conclusions in respect to the flaked stone assemblage is precisely documented at each step of analysis and replicable by other researchers.

Basic Process Studies

As a result of intensive studies over the past few years, the goals of the first component of "Basic Process Studies" — to come to a better understanding of the relation between cognition and behavior and to isolate a master list of behavior units (see Table 11) (Young and Bonnichsen (1984:43) which can be used to describe the behavior of different flintknappers — has largely been met.

The second component of "Basic Process Studies" still requires further work. The goal of this component is to provide a photographic reference collection illustrating the morphological results of specific kinds of behavior units to a variety of lithic materials. This reference collection should help archaeologists who are not themselves lithic craftsmen better understand the technological decisions and behaviors represented on artifacts under study. Briefly, the method of building this reference collection (which was also used for the experiments in this thesis) is as follows.

A number of preforms are prepared from a given material and dyed in a color which contrasts with the color of the rock so that flakes removed during the experiments leave clearly visible scars (the Lake Abitibi Welded Tuff material was dyed white). An accomplished lithic craftsman is then requested to use a specific behavior unit (such as moderate percussion thinning with a hammerstone) along one edge of the preform to provide an idea of the range of variation produced by the repeated use of the same unit. All of the most common behavior units are used in this way and the entire set of experiments videotaped and coded to insure that the craftsman used the specified set of input conditions for each behavior unit (such as support system, angle of force, amount of force, etc.).

Each of the resulting "experimental artifacts" is then photographed in stereo pairs and the photographs enlarged on 3 x 5, 5 x 7 or 8 x 10 prints so individual flake scars and morphological features can be studied with ease. When desired for analytical purposes, multiple copies of experimental specimen photographs can be cut in two lengthwise and combined in a variety of ways so morphological differences resulting from the application of different behavior units can be systematically studied. This is referred to as a morpho-contrast set.

A preliminary list of morphological attributes (Table 2) can then be used to describe each flake scar. Using these attributes we have been able to distinguish among the eight general kinds of production activities shown in Table 3, on the basis of flake scar morphology alone. It should be noted that these eight distinguishable activities were first studied in reference to Georgetown Flint, a material which provides a relatively clear morphological record. Not all these activities were equally as well represented or visible on some other materials such as the Welded Volcanic Tuff from Lake Abitibi.

In summary, the first component of experimental cognitive lithic studies described above, is used to define the behavior units employed by lithic craftsmen in natural technological production sequences; the second component involves having skilled craftsmen use these "natural units" in a controlled experimental situation where the connection between the application of a given unit and the resulting morphology can be isolated and studied. It is important to emphasize that this kind of basic research does not simply add a new series of technological attributes for archaeologists to add to existing lists. The cognitive experimental lithic approach tries to avoid the indiscriminate selection of as many attributes as possible and the statistical manipulation of these attributes in the search for patterning. Utilizing all the attributes which can be visually discriminated introduces too much "noise" into the system and tends to be used as a substitute for a genuine understanding of the processes responsible for flake scar morphology. Individual attributes are not nearly as important as the way in which groups of attributes are combined on an individual flake scar as the result of the application of a particular kind of production activity. The relation between behavior input and morphological output must be understood before moving on to the classification and interpretation of prehistoric artifacts.

Table 2. Preliminary Morphological Attributes Used to Describe Individual Flake Scars*

A. Sharpness of Proximal Edge (based on tactile test):

1. Sharp
2. Intermediate
3. Dull

B. Ribs (waves extending toward distal edge from platform):

1. Absent
2. Indistinct
3. Moderately distinct
4. Pronounced
5. Variable on same flake scar

C. Rib Spacing:

1. Not applicable
2. Relatively far apart and fairly evenly distributed across flake scar
3. Relatively far apart and found primarily near flake scar termination (distal edge)
4. Relatively close together and fairly evenly distributed across flake scar
5. Relatively close together and found primarily near flake scar termination (distal edge)
6. Other

D. Scales (semi-detached, incipient microflakes which may occur anywhere on the fracture surface):

1. Absent
2. Limited
3. Moderate
4. Extensive

E. Imbedded Flaking (secondary flake scar(s) imbedded in the primary scar; produced by the same action that removed the primary flake; generally found on margin of proximal edge):

1. Absent
2. Limited
3. Moderate
4. Extensive

Table 2 continued.

F. Microflaking on Proximal Edge (a series of tiny edge indentations produced by the same action that removed the primary flake):

1. Absent
2. Limited
3. Moderate
4. Extensive

G. Flake Scar Shape at Distal Edge:

1. Scar terminates in relatively straight distal edge
2. Scar terminates in rounded distal edge
3. Scar terminates in irregular distal edge

H. Flake Scar Size (based on a ratio between length of flake scar and width of artifact, measured from point of force application):

1. Almost imperceptible
2. Very minimal
3. Minimal
4. Moderate
5. Substantial

I. Morphology of Proximal Edge of Flake Scar (resulting from type and extent of force applied when flake is removed):

1. Edge relatively straight
2. Distinct U-shaped notch
3. Notch is either a flat curve or bell-shaped
4. Edge is rough but not distinctively notched
5. Other

* The specific list of attributes used for analysis in this dissertation can be found in Table 13.

Table 3. Representation of Production Activities Distinguishable on the Basis of Individual Flake Scar Morphology

Distinguishable Types of Production Activities							
Indirect Percussion	Percussion flaking		Pressure Flaking	Shearing (twisting motion across edge of artifact with flat tool surface)	Edge rubbing		
	Hard hammer (such as a hammerstone)	Soft hammer (such as a billet			Rub/Buffet (dragging the flat side of a tool across the edge of the artifact)	Abrade (rubbing the flat surface of a tool such as a grinder or hammerstone parallel to the edge)	Pressure rub (using the tip of the pressure flaker to gently push off small projections on the edge of the artifact or to create small notches in the process of isolating a platform).

Note.

The term "production activity" is restricted in use; it refers to general activities such as percussion flaking or shearing which may encompass a variety of behavior units.

Classification of Prehistoric Artifacts

As previously mentioned, in the Boreal Forest it is seldom safe to assume that an archaeological assemblage represents the work of a single group of people or even a single cultural tradition. Since an assemblage may be mixed, it is essential to describe each artifact in the assemblage. Because different kinds of artifacts may have different technological grammars, it is necessary to sort an assemblage into general artifact functional classes such as unifaces, stemmed bifaces, non-stemmed bifaces, flake tools and cores. It is important to note that each functional class (e.g., bifaces, scrapers, projectile points) should be analyzed separately.

Describing a single artifact involves examining the range of morphological features on an artifact and documenting how meaningful features are patterned on each flake scar. An informed judgment (using the attributes and morpho-contrast sets from the experimental studies) can then be made about the production activity responsible for each flake scar on prehistoric specimens. If the lithic materials represented in the assemblage (such as the Lake Abitibi Volcanic Tuff) are not adequately represented in the "on-hand" photographic and experimental artifact reference collection, the second component of "Basic Process Studies" previously described should be employed. This method involves having a skilled craftsman apply the most common behavior units (Table 1) on a lithic raw material similar to that represented in the assemblage. If possible, these materials should be collected from the same rock formation or a very similar one to the aboriginal quarry sites. Experimentation with techniques should be conducted until a good match between flake scars on experimental specimens and flake scars on prehistoric artifacts is achieved. As usual, the experiments are videotaped and the resulting experimental artifacts are photographed for inclusion in the photographic reference collection. Information on the Lake Abitibi lithic experiments is contained in Chapter V of this thesis.

After representative and complete (as opposed to overlapping and failed) flake scars have been classified, and sequencing of flake scars has been established in an attempt to recover the production strategies, it is possible to make some process inferences. For example, it might be possible to conclude that on one face the craftsman took off a series of edge strengthening flakes with a pressure flaker and then removed a final sequence of thinning flakes, using a pressure and an indirect percussion technique. This type of description is considerably different than describing artifacts in terms of form, shape measurements, or selected technological attributes.

In addition to this technological description, more standard types of archaeological data can also be analyzed in regards to artifact shape, size, use-wear patterns, and basic metric measurements of the specimen.

It is important to note here that part of the cognitive analysis involves an awareness and an accounting for, of any use-wear morphology on the prehistoric artifacts, especially the implications of use-wear morphology and attributes.

Use-wear studies inspired by Semenov's classic (1964) monograph, Prehistoric Technology, have become of increasing interest. Other milestones in the development of use-wear studies were monographs edited by Swanson (1975) and Hayden (1979). Most recently Lawrence H. Keely (1980) has summarized the current state-of-the-art of microwear analysis. Use-wear techniques involve the use of two different approaches. The most used one involves examination of wear traces with a low level magnifying stereo microscope. The alternative technique, of which Semenov and Keely are the major proponents, uses magnifications of greater than 80x to study polishes and striations.

It is interesting to note that use-wear researchers agree that the microwear analysis of archaeological specimens can only proceed by means of controlled experimental studies (Keely 1980:3). Although many researchers such as Hayden (1979) do not discuss it directly, there is a major need in use-wear studies for control over technologically based use-wear traces that may be confused with user caused morphology (Olausson 1980:52, Keely 1980:4). This point was also strongly made by Tringham et al., who stated that attributes relating to retouch and method of manufacture must be studied in combination with use-wear attributes in order to gain the fullest possible knowledge from stone tools (1973:173).

Almost all use-wear studies, like the cognitive approach to manufacturing technology, have been, to date, time consuming and limited in size and extent with emphasis on methodological and technical problems (Stafford and Stafford 1983:351).

The prehistoric specimens in this thesis were examined by means of low magnification and stereo photographs. This did not reveal any use-wear striations or other forms of use-wear apart from some abrasion from water tumbling. Edge damage and microflaking caused by use-wear is a potentially difficult problem as use-wear might produce small flake scars that could be confused with or obscure identification of morphology resulting from manufacturing techniques. No attempt was made however, to undertake a complete and detailed use-wear study.

Most of the specimens being studied here have also been found in water eroded deposits and some minor abrading effects have been caused by water tumbling or wear on a few specimens. This process, I believe, has obscured any use-wear traces (especially micro-wear) to a much more serious extent than it has affected the manufacturing traces as these are on a much larger or macro-morphological level.

It is clear that any comprehensive approach to lithic studies must include use-wear and function, and the cognitive approach is no exception. It is also apparent that the systematic and experimentally based study of use-wear morphology, although not at an advanced state, is indeed farther advanced than the study of manufacturing morphology. Despite its lack of any direct contribution to use-wear studies this thesis should be of assistance to such studies by identifying some types of edge morphology which are directly attributable to manufacturing techniques alone.

Returning to the technological analysis, once the basic analysis is completed for a particular artifact class (such as bifaces), these can then be grouped into "techno-types" on the basis of degree of overlap in production activities and how the resulting flake scars are sequenced on an artifact. In other words, because technological considerations are paramount, bifaces similar in shape or size may be put in different techno-types, and vice versa. Why are technological considerations considered more important than shape? Shape is a visual concept which can be communicated readily by copying from an example or a model. The idea of a particular hafting technique for example, would not be difficult to explain to others, once the original idea had occurred. Clovis fluted points provide a good exampe of a style based on a hafting technique which evidently caught on and spread like a fad across an entire continent within a relatively short period of time.

The reason lithic manufacturing technology is more conservative and less easily communicated than an outline shape is because manufacturing technology is a complicated process involving extremely complex knowledge and motor skills. Acquiring the necessary knowledge and skills requires up to twenty years of experience — often in an apprenticeship context. Once these skills have been acquired they become second nature to the craftsman. He may copy a new shape from a neighboring group but is unlikely to borrow the technology that goes with it. He will simply replicate the shape using his own fundamental techniques. It is this very conservative (because it is fundamental) nature of lithic manufacturing technology which makes it diagnostic and therefore of use to the archaeologist attempting to define new typologies leading to techno-types and techno-patterns, forming a basis for associating (on a judgmental or assumptive basis) prehistoric archaeological sites with particular cultural traditions or groups of people.

A constraint is in order before returning to the discussion of analytic classification steps. Not all aspects of manufacturing technology are diagnostic of specific technological traditions. Given the constraints provided by the raw material, there are only limited ways to break open a cobble and to remove flakes. Lithic craftsmen tend to perform some of these activities in very similar ways. It is therefore critical to discover those areas in which the craftsman has options open to him; it is these areas of "free choice" (Young 1976) which are most important for isolating cultural groups in time and space; they need to be weighed most heavily in classifying artifacts. These areas of free choice can only be isolated by working with living craftsmen. It remains to be learned how such "choices" are or can be culturally defined.

After artifacts have been sorted into "techno-types," it may be possible to cluster a set of techno-types exhibiting significant technological overlap into "techno-patterns," a more abstract unit of analysis which may include all the members of a given class (such as projectile points) within an assemblage.

Clustering artifacts on the basis of shared technology also makes it possible to link within-site artifact classes or to link different sites. For example, even though a stemmed and non-stemmed biface may differ considerably in shape and be from different prehistoric sites, if they are produced by similar production techniques, it is possible to encompass them in a single techno-complex. The totality of production techniques and associated rules for applying and sequencing these techniques can be referred to as a "production grammar." A study of morphological similarities and differences may indicate that more than one production grammar is represented in an assemblage. If so, it becomes possible to ask whether these differences in production grammar are due to the presence of different cultural groups, whether they reflect different sorts of activities within the same group, whether trade items are present, etc. Answering this question requires the addition of other kinds of data as outlined below.

Archaeological Reconstruction

After the typology has been formulated, it is possible to move to a more general analysis by evaluating a production grammar in terms of its distribution through time and across space. The production grammar can also be correlated with use-wear data and environmental data, including the flora and fauna with which the artifacts are associated. Whenever possible, an attempt is made to identify specific cultural traditions and reconstruct their adaptive strategies. This latter aspect of the research design is not unique as reconstructing prehistoric adaptive patterns, groups, and cultures is the professed goal of most archaeologists. The uniqueness of the cognitive experimental lithic approach lies in the way controlled, meaningful attributes are selected and used in a detailed analysis of individual flake scar morphology to produce a typology for describing and classifying stone tools.

Part Five: Summary-Discussion

The relevance of cognitive anthropology for the study of material culture was noted as far back as 1964 in a classic article by Sturtevant:

> Material culture resembles language in some important respects: some artifacts — for example, clothing — serve as arbitrary symbols for meanings . . . and occur in a limited number of discrete units whose combinability is restricted. Possibly complex phenomena of esthetics would yield to a similar approach. Studies in these areas are potentially of much importance for ethnography, and it seems wise not to restrict the meaning of ethnoscience to the study of _terminological_ systems.

Despite this admonition, in almost all studies undertaken to date, cognitive anthropologists have generally limited their investigation to the cultural structuring of kin terms, disease terms, color terms, etc. A major goal of this thesis is to attempt to break this barrier and apply cognitive insights to material culture and prehistoric archaeological artifacts. This is no easy task, however, as many archaeologists are pessimistic in regards to cognitive archaeology, arguing that it may be impossible to attribute cognitive significance to the patterning of attributes on artifacts when this patterning may simply be due to conditions imposed upon the cratfsman by the rock or to the requirements of function. This issue was dealt with briefly previously. It is handled more fully in _Understanding Stone Tools: A Cognitive Approach_, in which Young and Bonnichsen (1984) demonstrate that despite the fact that craftsmen tend to overlap in their use of behavior units, the way that behavior units are strung together to solve technological problems provides opportunity for significant craftsman (and perhaps cultural) variation.

It is important to note that many archaeologists are suspicious of "cognitively derived experimental archaeology" for less sophisticated reasons; they mistakenly assume that the cognitive approach must be a type of "paleopsychology" — the study of prehistoric cognitive structures and motivations. It should be strongly emphasized that the so-called "cognitive approach" should not be described as psychological in the normal sense. Rather it is based on the simple observation that archaeologists should not classify prehistoric artifacts without taking manufacturing processes into account. To do this requires either speculating about the technological information available to the aboriginal craftsman and how the artifact was used, or making more informed inferences on the basis of experimental data derived from recording technological decisions made by living craftsmen. In either case; the technological strategies employed by the craftsman are basic to the analyses employed by the archaeologist.

Although the cognitive approach to the study of variation in lithic production strategies is not intended to replace other more traditional typological approaches, it is hoped that archaeologists will come to see it as a useful way to decode the stone tool technology left by prehistoric peoples. The method is especially applicable to archaeological sites where recovery of normal range archaeological data is not possible and where, by necessity, a heavy reliance has to be placed on stone tool analysis to reconstruct culture history.

In the past, a typology based on general outline shape or stylistic attributes has been used to identify prehistoric site assemblages. These "type" projectile points have been dated, and time ranges estimated for each point style. The writer believes that this has been successful in defining broad time horizons as represented by these stylistic trends. However, I also believe that many of these broad geographic and temporal horizons as represented by single or co-existing projectile point styles are multi-cultural, and the more geographical spread and temporal depth, the greater the possibility of multi-cultural use of a single point style. A good example would be Oxbow points which have been found throughout the Northern Plains, east to the Boreal Forest and north to the edge of the Sub Arctic regions. It is my contention that these stylistically similar or identical Oxbow projectile points were made by many different cultures – peoples of different linguistic and biological backgrounds (Pollock 1981:153). A case can be made that stylistic influence is readily transferrable cross-culturally as evident by the spread of western clothing styles, etc., throughout the world. Projectile point shape or stylistic outline form would also be readily transferrable either by copying an example or even by drawing a simple picture. How then can one separate the projectile point stylistic types into specific cultural groups on a regional basis? The answer, I believe, lies in manufacturing technology. It has become apparent, as more sites are excavated, that the archaeological record is much more complex than many of us ever imagined, and considerably more varied. In my opinion, it has become increasingly difficult to fit a given site neatly into many of our pre-existing cultural phases, especially in the boreal forest areas.

The inherent complexity of stone tools in their own right was readily apparent to me the first time I attempted to analyze them as a novice archaeologist at the University of Toronto many years ago. I had a great deal of difficulty at that time until I was taught to sort them into size, shape and artifact classes. This shape-functional approach was effective and allowed one to produce a coherent description of assemblages quickly. Using this technique of style and artifact class, plus some metric attributes, allowed myself and others to produce regional cultural chronological sequences. Stone tools have been especially important in the boreal forest regions where there is a paucity of ceramics, bone preservation and stratified sites. This places a heavy reliance on stone tools for cultural reconstructions. Further complicating boreal forest archaeology is the problem of the generally small numbers of stone tools recovered, and the tremendous diversity found in these small samples in terms of shape and stylistic forms. If stone tools were ever to be used to answer many questions regarding cultural evolution and development in the boreal forest, a different typological method was needed. What was especially frustrating to me, utilizing the more traditional normative approach, which looks for central tendencies in the data, was that one had to make a large jump from one's basic observational and descriptive stone tool data directly to propositions and inferences regarding specific cultures. There was no middle ground or middle range theory allowing one to understand and ask the right questions of the tremendous variation in the boreal forest archaeological lithic record. In terms of the cognitive approach, middle range theory means not just the study of site formation processes but a set or continuum of data transformation procedures from the most basic levels to increasingly higher levels of generalization (Table 4).

The concept of middle range theory was initially developed by sociologists Talcott Parsons and Robert K. Merton, who, in order to

(4) General Theory:
cultural evolution, culture process and culture change.

(3) Culture History Level:
propositions and inferences regarding specific prehistoric cultures.

(2) Inferential Level:
no middle range theory, no systematic steps of data, instead, educated inferences used to interpret basic lithic data. Inferences made are not easily replicable by other researchers.

(1) Empirical Level:
basic level lithic data consisting of descriptive metrical data, stylistic or shape typology, artifact classes, projectile point identifications and other forms of non-lithic archaeological data.

CHRONICLING APPROACH

(2) Middle Range Theory Level:
middle range cognitive theory of technology used to provide a series of systematic steps whereby data is transformed from the empirical level to increasingly higher levels of generalizations. Results and inferences are replicable and testable by other researchers.

(1) Empirical Level:
dynamic and processual basic level lithic data consisting of some descriptive metrics but mainly technological data obtained from first hand observation of artifact production procedures undertaken by a skilled craftsman - behavior units, production units plus other relevant non-lithic archaeological data.

COGNITIVE APPROACH

Table 4. Comparative Theoretical Orientations

explain society, utilized structural-functional theories which led to a general category of equilibrium and systems theory (Firth 1955:255, Appelbaum 1970:10-11). By providing a framework for a number of diverse observations and social system components, the structural-functionalist and subsequent variants such as systems theory, served to advance the understanding of social systems.

As was the case with sociology, the purpose of middle range theory in archaeology is to provide a framework for ideas and hypotheses about how the archaeological record is formed. As such, middle range theory attempts to gather together many diverse elements such as manufacturing, use-wear, and site formation processes. Binford has stated that "middle range research results in the production of knowledge and understanding that may grow, serving as the research based paradigmatic underpinning of science" (1982:128). Furthermore, he states that,

> What we are seeking through middle range research are accurate means of identification and good instruments for measuring specified properties of past cultural systems. We are seeking reliable cognitive devices . . .
> (Binford 1982:129)

Middle range theory is dynamic and processual being based on observations and experiments giving rise to principles which can be applied in many situations. One of the goals of my thesis is to summarize the initial outlines of a general theory of cognitive based experimental approach to artifact manufacture. A more specific goal is to demonstrate through an actual case study how the general cognitive theory and method can be applied to specific situations. I believe the cognitive approach to archaeology by combining three approaches to lithic artifacts, i.e., the artifact as an object to measure and observe (outline form and metrics), the artifact as an object to be interpreted through use of experimental cognitive data, and the artifact as a functional tool (i.e., how it was used), will eventually lead to the development of a general theory of archaeological lithics and their role in cultural evolution.

It should be noted that this thesis is not a duplicate or parallel study to previous research, but represents the very first systematic application and test of the cognitive approach to prehistoric site collections. As such, it contains new theoretical and methodological developments in regard to the analysis of prehistoric artifacts.

Turning to culture history, it has been of concern to me in recent years that the application of stone tool studies to culture-historical problems has not been a growing area of interest or interpretive productivity. This is despite the fact that interest in lithics at the fracture mechanics use-wear and experimental replication of techniques levels has been strong. One explanation is perhaps due to the fact that such studies which also include this thesis are all in a developmental stage. Appropriate research theory, techniques and methods need to be developed before regional lithic studies can be undertaken and applied to culture historical problems and hypotheses. New approaches such as the cognitive approach found in this thesis are at present time consuming and require a great deal more effort than traditional typologies. However, I am confident this initial disadvantage can be overcome by building up appropriate raw material reference collections, mechanical attribute coding and computer matching of morphological sets, thereby making the approach of greater practical application. Because this thesis is a prototype, all aspects of the approach must be explored and explained. Some of this detail, no doubt, can be eliminated from future studies.

CHAPTER II

ARCHAEOLOGY OF LAKE ABITIBI AND ADJACENT REGIONS

Introductory Note

The following three chapters (Chapters II to IV) are intended to provide background information on the study area and the prehistoric sites involved in the thesis research. These chapters will be of interest to those involved in studying the cultural history of north-eastern Ontario. Those more interested in the methodology of the cognitive approach may wish to proceed directly to the analysis undertaken in Chapter V.

Part One: General Environment and Ethnology of Lake Abitibi

The Lake Abitibi area is characterized by two different topographical expressions. One is the upland shield country as exemplified by the Ghost Mountain Range, while the other comprises the rolling Cochrane Clay Plain (Putnam 1952:296) laid down as bottom deposit from glacial Lake Barlow. The upland or bedrock shield areas have been called the Abitibi Uplands by Bostock (1970:16). The greater part of the Uplands lies between 900 and 1200 feet above mean sea level (Bostock

1970:16). Thus, two major landforms dominate the Lake Abitibi area. One is the sandy and rocky upland Shield with its low hills and ridges; the other is a gently undulating clay plain laid down by glacial lake deposits.

Presently, the major plant species of the region include jackpine, black spruce and mixed forest typical of the boreal forest (Baldwin 1958, 1962). Some small remnants of the Great Lakes - St. Lawrence forest type persist, although many of these species are at their far northern limit.

In regard to fauna, 23 species of mammals are currently known for the area. From previous archaeological work in the area (Pollock 1975c, 1976) it is known that beaver, moose, caribou, porcupine and dog or wolf were important prehistorically. Fish were also an important dietary element for prehistoric peoples of Lake Abitibi, especially at the spring/fall spawning runs when they were obtained at the mouths of tributary streams flowing into Lake Abitibi. Today, important species include pike (Esox lucius), walleye (Stizostedion vitreum) and suckers (Catostomas commersonii).

In regard to climate, Chapman and Thomas (1968:58, see Table 5) delineate three separate climatic regions for the Kirkland Lake District. They encompass the Northern Clay Belt to the north, the Height of Land, and the Timiskaming Clay Plain. The Lake Abitibi area is situated in the Northern Clay Belt climatic zone (Table 5).

Table 5. Lake Abitibi Area Climatic Zones

	Timiskaming	Height of Land	Northern Clay Belt
Altitude (feet above sea level)	600-1000	1000-1600	700-1000
Mean annual temperature (F°)	36	34	34
Mean annual minimum temperature (F°)	-35	-45	-40
Mean date of last frost in spring	June 10	June 15	June 8
Mean date of first frost in fall	Sept. 13	Sept. 2	Sept. 7
Mean annual frost-free period	96	80	92
Start of growing season	Apr. 27	May 5	May 7

Ethnology of Native Peoples Since European Contact

Although native people have no doubt resided around Lake Abitibi since the last deglaciation, for a few brief years in the 1970s there were no native peoples permanently resident on the Ontario portion of Lake Abitibi. However, as in the past this situation has since changed and Indian peoples are again (1982-83) living year round on the lake.

Previously, the Abitibi Dominion Band and the Abitibi Ontario Band (now located near Amos, Quebec and sometimes on Lake Abitibi), were traditionally connected with our area of study (MacPherson 1932; Jenkins 1939). John T. MacPherson (1930:7) considered the Abitibi to be "an off-shoot of the Ojibway Indians . . . some writers believe they sprung from a common base southwest of Lake Superior. . . ." but, MacPherson also mentioned that "the casual observer would have difficulty in detecting the difference between the Abitibi and the neighbouring Cree" (MacPherson 1930:7).

Prior to 1939, the Abitibi occupied a hunting territory of 148 miles wide and 160 miles long, comprising some 22,400 square miles (Jenkins 1939:2) (Figure 2). Jenkins (ibid.) mentions that the Abitibi "are bounded on the west by the Ojibway, on the north by the Cree, on the east by the Montagnais, and on the south by the Timiskaming Algonquin." Jenkins clearly did not wish to assign a dialect or language grouping to the Abitibi.

The Abitibi are mentioned for the first time in the Jesuit Relations of 1640. They appear again in the Relation of 1660 in connection with a raid by the Iroquois (Orr 1921:26).

Others have associated the Abitibi with the Tetes de Boule (Orr

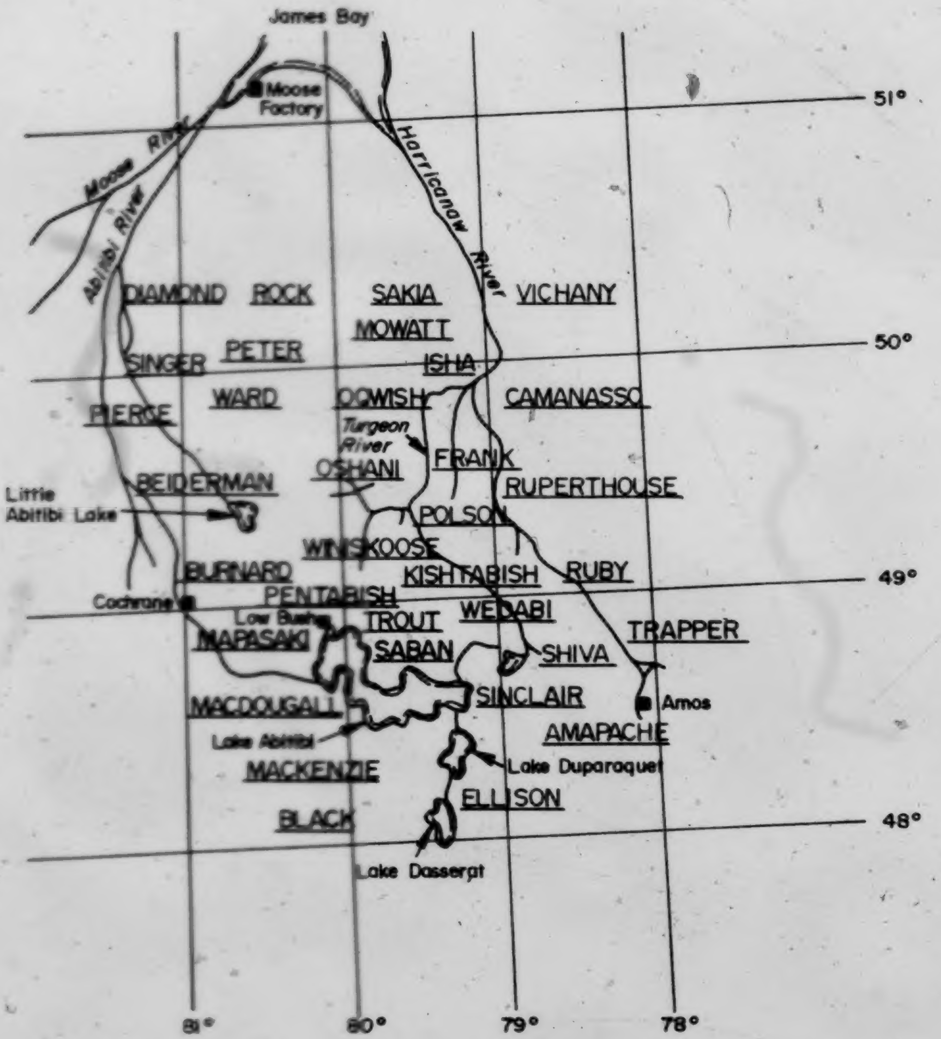

James Bay
Moose Factory
Moose River
Abitibi River
Harricanaw River
51°
DIAMOND
ROCK
SAKIA
VICHANY
MOWATT
50°
SINGER
PETER
ISHA
PIERCE
WARD
OOWISH
CAMANASSO
Turgeon River
FRANK
OSHANI
BEIDERMAN
RUPERTHOUSE
Little Abitibi Lake
POLSON
WINISKOOSE
BURNARD
KISHTABISH
RUBY
49°
Cochrane
PENTABISH
Low Bush
WEDABI
TROUT
TRAPPER
MAPASAKI
SABAN
SHIVA
Amos
SINCLAIR
MACDOUGALL
Lake Abitibi
AMAPACHE
Lake Duparaquet
MACKENZIE
ELLISON
BLACK
48°
Lake Dasserat
81°
80°
79°
78°

Figure 2: Approximate family hunting territories of the Abitibis - Ontario and Quebec (Jenkins 1939; Figure 28).

1921-22:26). According to Orr (1921-22:26) there is a clear relationship between the Tetes de Boule, Timiskamings and the Abitibi. Speck (1915:13) also mentions that these people (the Timiskamings and Abitibi) consider themselves to be of the same culture and dialect grouping.

It is possible that Tetes de Boule in this case represent various Algonquin bands of the Ottawa River. It seems from the evidence that the Abitibi are most closely related to the Algonquin peoples and that the Direct Historic Approach for this area must begin with historic Algonquin sites (as these people represent the prehistoric archaeology).

Apparently, the Abitibi, during early historic times, lived for the most part in conical lodges and had definite hunting territories (MacPherson 1930:8). With regard to their social organization, MacPherson says that there was little recognition of social bonds in 1930 apart from the family unit. Too, at that time even the oldest band members had no knowledge of totemic clans (MacPherson 1930:8).

Of material culture, even in 1930 the Abitibi still occasionally used bone and flint knives as well as wooden spoons and plates of birch bark (MacPherson 1930:35). For hunting, the Abitibi used a fairly long bow with an arrow headed by flint. Small game and waterfowl were shot with bone-tipped arrows, while blunt arrows were used for partridge (MacPherson 1930:38-39).

As previously mentioned, sites of the early historic Abitibi should prove immensely valuable in trying to apply the Direct Historic Approach. Frank Ridley (1966:42) has located such sites on Lake Abitibi, namely: the Ghost River Garden site, the Ghost River Island site, and the Abitibi River Point site. The Ghost River Garden site is located on a promontory at the mouth of the Ghost River, where Ridley excavated 475 square feet (Ridley 1966:34).

Thomas E. Lee (1965) excavated historic materials on the Quebec side of Lake Abitibi. His Louis and Iroquoian Point sites at the mouth of the Duparquet River are helpful in establishing the nature of the historic acculturation in this region.

Part Two: Northern Ontario Prehistory

In order to maintain a continuity with the cultural-chronological sequence currently being employed by northern Ontario researchers (Table 1), the following chronological outline will be used in discussing northern Ontario prehistory and history:

(a) Late Paleo-Indians - circa 7000 - 5000 B.C.
(b) Shield Archaic - circa 5000 - 500 B.C.
(c) Initial and Middle Woodland - circa 500 B.C. - 900 A.D.
(d) Terminal Woodland - circa 900 A.D. - 1700 A.D.

The Late Paleo-Indian Period (circa 7000 - 5000 B.C.)

The Early Paleo period equated with Clovis style points has not been identified in northern Ontario to date; however, there is ample evidence indicating the presence of Late Paleo peoples particularly in northwestern and northcentral Ontario and related developments along the north shore of Georgian Bay and on Manitoulin Island. The Late Paleo complexes are characterized by extremely well made "Plano" points similar in form to the Agate Basin points of the western plains. In northern Ontario and especially around Thunder Bay, complexes are found in direct association with fossil glacial lake beach lines, well inland from present day lake levels.

In northwestern Ontario, Late Paleo campsites are found along the Glacial Lake Agassiz strandline several kilometres inland from the present shoreline of the Rainy River and Lake of the Woods. The projectile points are characteristically lanceolate (leaf-shaped) in form, with ground bases and edges and a diagnostic pattern of shallow parallel flake scars running either diagonally or horizontally across both faces of the point (Reid 1980:3, 4).

In northcentral Ontario, a major Late Paleo occupation has been documented and dated in association with the Glacial Lake Minong beach line in the vicinity of the city of Thunder Bay (Fox 1975, 1977a, 1977b) (Newton 1975, 1977). This Late Paleo occupation termed the Lakehead Complex represents a primarily littoral (lakeshore) settlement pattern consisting of a series of small secondary campsites generally located at a point where the Minong beach line has been cut by rivers or streams draining into the lake (Fox 1975:34). In addition to these secondary sites, however, the Lakehead complex also known from a series of major quarry workshop sites (particularly the Cummins site), is associated with taconite and jasper taconite outcrops.

A second area of Late Paleo quarry/workshop activity has been identified on Knife Lake on the Boundary Waters in Quetico Provincial Park. Only one Paleo site has been located on Knife Lake to date. However, as this lake is the source of a second raw material type, felsite, which occurs in small frequencies on sites in the Thunder Bay area, the site is important as it indicates a direct association between these inland Paleo sites and the coastal Lakehead Complex sites (Fox 1977a:2).

Southeast of Sault Ste. Marie, along the north shore of Georgian Bay and on Manitoulin Island, another northern Late Paleo complex utilized a fine grained high quality quartzite. The Sheguiandah site on Manitoulin Island represents an extensive quarry/workshop operation where prehistoric peoples have been mining quartzite from the primary deposits and manufacturing stone tools from it since at least the Late

Paleo-Indian period. A series of Late Paleo-Indian sites have also been located on the mainland of Georgian Bay, which have produced stone tools attributed to a Late Paleo occupation which were manufactured Sheguiandah quartzites from Manitoulin Island. These sites are located on post-Algonquian strandlines and are assumed to represent Late Paleo occupations (Storck 1979:72, Lee 1957).

The Shield Archaic (circa 5000 - 500 B.C.)

The term Shield Archaic was initially defined by Wright as representing:

> . . . a widespread stone tool complex characterized by biface and uniface blades, lanceolate and side-notched projectile points, a wide range of scraper varieties, crude chopping and scraping-cutting tools and a paucity or absence of stone grinding.
>
> (Wright 1968a:57)

The Shield Archaic stage in northern Ontario is comparable to the Archaic period in southern Ontario in terms of its longevity, representing as it does some 5000 years of northern Ontario's prehistory; and in the fact that although it is one of the least comprehended prehistoric stages in terms of its distribution, however, it represents the most widespread prehistoric occupation in northern Ontario, stretching from the Manitoba border on the west to the Quebec border on the east and north along James and Hudson's Bays.

The Shield Archaic appears to evolve directly out of the preceding Late Paleo occupations, although this evolution remains to be demonstrated conclusively. The presence of Shield Archaic quarry/workshop and habitation sites on the Nipissing beach line (the next glacial lake stage below Minong in the Thunder Bay area), combined with an emphasis on the same raw materials as used in the preceding Paleo-Indian period and a similar technology centered on the production of large bifaces and somewhat less refined lanceolate points, supports Wright's hypothesis of a continuation. However, more work in other areas is required to demonstrate conclusively the transition. Following what appears to be the initial Shield Archaic period which is characterized by large bifaces and lanceolate points, there is an apparent proliferation of point styles including various forms of stemmed and notched points, however the lack of stratigraphic separation of these point styles have precluded establishment of a chronological order (Newton 1977).

Reid (1980:5) has identified a definite Shield Archaic occupation in the northern portions of northwestern Ontario with what has been called a Plains Archaic occupation in the southern portion. All sites are represented by a variety of notched plains point styles including Oxbow and McKean.

In northeastern Ontario, during previous research projects I identified the Abitibi Narrows Phase on Lake Abitibi, and assigned it a tentative date of circa 6000 - 3000 B.C. The Jessup site (DdGw-2) analyzed in this thesis, is a component of this phase. The phase is characterized by:

> . . . large percussion flaked (predominantly greywacke) implements, large bifaces, ovate blades, leaf-shaped bifaces, predominantly large crescentic end scrapers (over 10 grams), some small end scrapers, bifacial core chopping tools, core derived lanceolate and stemmed points.
>
> (Pollock 1975c, 1976)

The results of a recent analysis by Ingrid Kritsch-Armstrong of excavated materials from the Jessup site have demonstrated that the site is a Shield Archaic site (1982:238). Previous analysis of collections from Lake Abitibi (including the Jessup and Jordan sites) have indicated the presence of another form of artifact which may be diagnostic of the Shield Archaic period; the trihedral adze (Fox 1977c). Trihedral adzes are presumed wood working tools which are manufactured primarily from siltstones or greywackes. The adzes are roughly triangular in section, pointed at the butt end, ground to a cutting edge at the bit end, rounded on top and flat on the bottom, and flaked all over the upper surface. Similar artifacts have been recovered from northcentral Ontario from lakes adjacent to the Knife Lake greywacke deposits, from Dog Lake north of Thunder Bay, and from several other locations east of Thunder Bay (Newton 1975, Fox 1977, McLeod 1981).

I have also defined what might be a terminal Shield Archaic phase (the Mattawan Phase) dated to 970 +/- 300 B.C. on Lake Nipissing in northeastern Ontario. This phase is characterized by:

> . . . lanceolate, stemmed, and expanding convex based side-notched points, with small end scrapers, leaf-shaped biface blades, ovate bifaces, side scrapers, chipped bifacial core choppers and small retouched random flakes.
>
> (Pollock 1975c:12)

Shield Archaic occupations were also recognized from associated projectile points at the Sheguiandah site on Manitoulin Island, associated with the quartzite deposits and workshop operations (Fox: pers. comm.). There are also indications of Shield Archaic peoples in the southern Shield Extension into the eastern part of southern Ontario, particularly along the Ottawa and Mattawa River Systems (Wright 1978:24).

One of the more significant developments to occur during the Shield Archaic period was the beginning of metal working associated with native copper deposits around Lake Superior. Copper was mined, heated and hammered into a variety of artifacts, including knives, projectile points, spear points, beads, bracelets, gaff hooks, axes, adzes and chisels to name but a few types, and these artifacts formed the basis of an exchange system between the Upper Great Lakes region and groups to the south, east and west. Although there are no dates available from northern Ontario to indicate when copper began to be used, we can infer from the radio carbon 14 date obtained for the Morrison's Island site on the Ottawa River, that the industry was well underway at least as early as 2750 B.C. +/- 150 (Kennedy 1967:114, Ritchie 1969:91).

Reid notes that around 5000 B.C. the climate of northwestern Ontario became warmer and drier ". . . possibly changing the southern portion of the region into a prairie or parkland environment" (Reid 1980:5). Associated with this warming trend was a change in animal and plant populations (bison, prairie plants, etc.) and a shift in subsistence patterns. Presumably, at this time, elements of Plains Archaic culture would have begun to appear in the region. A similar warming trend is also hypothesized for northcentral Ontario, associated with a change in plant and animal communities. It has been suggested that in reaction to this change in the environment there was a corresponding change in the artifact assemblages which included ". . . a reduction in the size of projectile points and the appearance of fishing technology" (Arthurs 1979:5).

After temperatures gradually cooled and the climate and environment assumed the pattern normally associated with northern Ontario today. The subsistence patterns traditionally attributed to northern hunting/gathering groups were probably established during the later stages of the Shield Archaic Period, as indicated by the predominance of moose and beaver in the faunal assemblages associated with various prehistoric components in the region (Pollock 1975c:50).

Initial Woodland Period

Laurel (circa 500 B.C. - 900 A.D)

The term Laurel was first applied by Wilford to ". . . Middle Woodland burial mounds in extreme northern Minnesota. . . ." (Wright 1967:1). Wright, on the basis of the analysis of sixteen Laurel components in northern Ontario, lists the following as being the ". . . most characteristic traits of the Laurel Tradition . . .: ceramics sherds, scrapers, paintstone nodules, linear flakes, biface blades, projectile points, abraders, copper beads, net sinkers, ceramic wastage and copper nuggets" (ibid. 97). Wright's trait list agrees in part with that given by Stoltman for Laurel sites in northern Minnesota. Stoltman more specifically indicates that the Laurel culture is characterized by an artifact assemblage that includes:

> . . . the earliest ceramics in the area, a lithic industry typified by numerous end-scrapers and stemmed and notched projectile points, and a bone-antler industry whose hallmarks are cut beaver incisors and socketed and perforated antler harpoons. . . . Native copper was commonly worked into awls, beads and other simple forms in sites of the Lake Superior Basin. . . . and traded into adjacent areas.
>
> (Stoltman 1973:3)

Stoltman adds that:

> Evidence of contact with the Hopewellian 'Interaction Sphere' might be seen in the occasional appearance of obsidian at some sites. . . . and in the practice of mound burial in Minnesota and adjacent Ontario.
>
> (ibid. 3)

Laurel ceramics have been characterized by Stoltman as being:

> . . . tempered with crushed rock, had their exterior surfaces smoothed but rarely if ever cord marked, and had the upper rim area decorated mainly with a variety of dentate stamps, often applied in a push-pull or stab-and-drag fashion.
>
> (ibid. 3)

In northern Ontario, Laurel ceramics are quite often decorated with a pseudo-scallop shell motif; a motif held in common with Middle Woodland cultures of southern Ontario including Saugeen and Point Peninsula, with whom they interacted (Wright 1967).

The origins of Laurel are still somewhat equivocal, with some archaeologists maintaining that Laurel developed at least in part out of preceding Archaic cultures (Kritsch-Armstrong 1982, Pollock 1975), while others suggest a southern origin for Laurel peoples, who moved into the Upper Great Lakes area from a southern base (Salzer 1974, Steinbring 1974, Stoltman 1973).

Settlement data determined through excavations in northwestern Ontario indicate that, "Most Laurel sites in the region are small encampments with the remains of no more than two lodges for one or two extended families (about 25 people including grandparents, aunts, uncles, parents and children). The outline of Laurel house structures were uncovered during excavation and consisted of . . . oval lines of stones surrounding the remains of cooking hearths, the stones probably serving to weigh down the lodge coverings" (Reid 1980:9).

Laurel is widespread throughout northern Ontario, stretching east from Lake of the Woods along the Boundary Waters, along the north shore of Lake Superior and into northeastern Ontario (Newton 1975, Pollock 1975, Reid 1980).

Laurel peoples maintained the same hunting and gathering type of subsistence pattern established during the Archaic period. Stoltman (1973:113) notes that a variety of large and small game were hunted ". . . with moose and beaver being especially important." Stoltman also emphasizes the importance of fish and wild rice resources in the Laurel diet, indicated by a "pronounced seasonality that involves the intense exploitation of fish in the warmer months of the year" (ibid. 113). The presence of moose remains along with net sinkers and bone harpoons from Laurel sites in Ontario indicates a similar hunting/fishing subsistence pattern to that demonstrated in Minnesota (Newton 1974, Pollock 1975, Wright 1967).

Terminal Woodland

Blackduck (A.D. 900 - Historic Period)

Once again the origins of Blackduck are heatedly debated by archaeologists; as Arthurs notes: "We do not know yet whether they were the descendants of the earlier Laurel peoples or moved into the region from the south or a combination of both" (in Reid 1980c:13-14). The cultural affiliation of Blackduck also remains in question, some researchers attributing it to Cree or ". . . another Algonquian speaking group related to Cree," while others suggest that they are Ojibway or even Assiniboine (ibid. 14-15).

Blackduck artifact assemblages typically include:

> . . . triangular projectile points, long-bone fleshers, unilateral barbed bone points, bird bone whistles, antler flakers and side scrapers of several varieties. Ceramics are distinctive in that cord marked bodies, punctates, oblique lines on rim and lip and horizontal or herring bone lines on the neck predominate.
> (Pollock 1975c:16)

Reid suggests that Blackduck peoples in northwestern Ontario:

> . . . probably wintered in small groups of about 20 - 40 people but gathered together in large villages of several hundred people for the fall ricing and spring sturgeon runs. . .
>
> (Reid 1980c:14)

Blackduck sites have been identified from Manitoba east along the Boundary Waters and along the north shore of Lake Superior to Sault Ste. Marie where Blackduck wares appear in only very small frequencies on sites such as the Whitefish Island site. I have also identified Blackduck material in Missinaibi Provincial Park to the east of Lake Superior, and some possibly Blackduck-like wares have also been reported from the Shield area of eastern Ontario (Pollock 1975c:16-19; Phil Wright: personal communication).

Selkirk

Selkirk represents a second indigenous Terminal Woodland culture which developed at the same time as Blackduck. The two cultures overlapped in northwestern Ontario and along the coast of James Bay and Hudson's Bay. Selkirk is found to the north of Blackduck in north-central Ontario, Blackduck being located predominantly in the vicinity of the Lake Superior watershed. The major difference between Blackduck and Selkirk material culture is in the ceramics, Selkirk pottery being fabric impressed as opposed to cord impressed. Aside from this feature, the two cultures share similar patterns of subsistence and habitation. Also in northwestern Ontario there is a strong preponderance of Iroquoian pottery styles during the late prehistoric period. Selkirk is believed to represent prehistoric Cree groups. I have identified a number of separate cultural traditions in northeastern Ontario relating to prehistoric Cree (The Moose River Cree Tradition, 1200 A.D. - 1650 A.D.), and northern Algonquin groups (The Northern Algonquin Tradition, 800 A.D. - 1650 A.D.) in northeastern Ontario (Pollock 1975:20-25).

The Moose River Cree Tradition represents an occupation in the western Moose River and eastern Albany River basins by indigenous Cree groups from approximately 1200 A.D. to 1650 A.D. The Northern Algonquin Tradition (Northern Ottawa River drainage system) consists of two phases, the Duncan Lake Phase (800 A.D. - 1300 A.D.) which shows ". . . clear developmental traits from the preceding Laurel Tradition and the Ghost River Phase (1300 - 1650 A.D.), with the latter exhibiting a complete sharing of the Iroquoian pottery complex" (ibid. 23). Also, I have stated that:

> This tradition geographically corresponds to the area (Lake Timiskaming - Northern Ottawa River) occupied in the early historic period by Algonquian speaking people known as Algonquins and thus, the prehistoric assemblages are deemed to relate to these people.
> (ibid. 23)

The groups now known as Ojibwa, Cree, and Algonquin may have been formed from the late prehistoric Blackduck and Selkirk as well as other late prehistoric Algonquian speaking cultures influenced by the Iroquois. I believe that the hypothesized Algonquian speaking prehistoric cultural sequence on Lake Abitibi extends back to the Abitibi Narrows phase of the Shield Archaic tradition or earlier, and is directly ancestral to historic Northern Algonquian groups and may also be specifically ancestral to Cree and other Algonquian speakers. Thus the Shield Archaic phase presents intriguing possibilities for the initial occupation and diffusion of early peoples in northeastern Ontario and adjacent Quebec (Pollock 1975c:26). As well, I have suggested that two phases of the Northern Algonquin tradition evolved from the preceding Shield Archaic and Laurel traditions. These phases are found on the upper Ottawa/Lake Timiskaming and Lake Abitibi/Abitibi River drainage basins. An early Duncan Lake phase has been described, followed by a terminal Woodland Ghost River phase. This later phase is distinguished by the complete acceptance by Northern Algonquin peoples of the Ontario Iroquois pottery complex, including the local manufacture of Iroquois ceramics (Pollock 1975c:26).

The task of connecting prehistoric assemblages on Lake Abitibi and elsewhere is made difficult by the fact that during the early historic periods a form of Pan-Algonquian culture developed due to large scale migrations precipitated by the mid-seventeenth century Iroquois wars, the disruption of traditional movements due to the economic influence of the fur trade, which also no doubt encouraged migration; and an expansion of traditional hunting and subsistence areas. The influence of disease, the central economic attraction of the trading posts, and the new European material culture often caused a blending of cultural groups in a more homogeneous culture than in prehistoric times when the groups may have been more geographically separated, perhaps closely associated with a particular drainage system (i.e., the Moose River or Ottawa River system in northeastern Ontario). Contact between groups would have taken place but incentive for contact, travel and trade may have been much less during prehistoric times.

I believe that the late prehistoric peoples of the Lake Abitibi region were neither Cree nor Ojibway but formed part of a northern extension of the Ottawa Valley "Algonquin" peoples which were closely connected to the Lake Timiskaming Algonquin. The Timiskaming Algonquin were situated on the northeast shore of Lake Timiskaming and numbered

211 persons in 1911 (Speck 1915). They were a modified cultural group due to contact with their neighbours at Bear Island, Lake Temagami (ibid. 1915:2). Speck (ibid. 3) also mentioned that these people considered themselves to be most closely connected to the Lake Abitibi "Bluewater Peoples," and the Mattawa and Ottawa River Algonquin bands (Pollock 1976:21-41). As discussed in the preceding section, the historic confusions as to the linguistic and biological/cultural groupings can be at least partially attributed to the Iroquois raids during the 1600s, which caused considerable movement and relocation of inhabitants throughout Ontario. As a result considerable blending took place and a further blending of cultures developed during the fur trade era. This blending makes reconstruction of prehistoric peoples from ethnographic data alone an exercise fraught with confusion and error.

Part Three: Previous Archaeological Work, Lake Abitibi and Vicinity

Prehistoric sites on Lake Abitibi are both numerous and rich in artifactual remains. Evidently the area was a major centre for people since the retreat of the last glaciation and ranks in terms of numbers and density of sites among the richest within the boreal forest environment of Canada. The entire story of prehistoric peoples for northeastern Ontario from 6000 B.C. to fur trade days is present on Lake Abitibi. This complete archaeological record is rarely found in one geographical area, and greatly increases the archaeological importance of the area. Prior to 1982 some twenty-four archaeological sites were known for the lake. With the thirty-three additional sites recorded by Pollock and McLeod during 1982, the total documented prehistoric sites for the Ontario portion only of Lake Abitibi is fifty-six (see Table 4 and Figure 5).

The pioneer archaeologist on the Ontario portion of Lake Abitibi was Mr. Frank Ridley (1956, 1958, 1966). During the years from 1954 to 1962, Ridley undertook archaeological surveys and excavations which resulted in the location of archaic, middle woodland, terminal woodland, and historic sites. No further work was again undertaken until 1970. Subsequently, Justin and Marjorie Jordan undertook numerous "search and survey" expeditions continuously throughout the years 1970 to 1982. Accompanied by Bill Therriault and Bob Stewart of the Ontario Ministry of Natural Resources, I first visited Lake Abitibi during August 26 - 27, 1975. At that time I was the regional archaeologist for the Northern Region of the Ontario Ministry of Natural Resources. Later that same year, a short trip was made with the Jordans and Thor Conway.

long time regional archaeologist based at Sault Ste. Marie, Ontario. It is entirely due to the foresight and initiative of the Jordans that archaeology on Lake Abitibi was carried on. Their work made possible the writer's thesis research and that of the other current area researcher, Ingrid Kritsch-Armstrong (1980, 1982).

On the Quebec side of the lake, pioneering fieldwork was undertaken by Thomas E. Lee in 1962 and 1964, the results of which were published in a 1965 monograph (Lee 1965). Since 1970, Roger Marois, of the Archaeological Survey of Canada, has excavated several mainly late woodland sites along the eastern shore of Riviere Duparquet on the Quebec side of Lake Abitibi (Kritsch-Armstrong 1980).

As well, during 1977, W. E. Noble continued the writer's 1973 excavations at the Pearl Beach Site on Larder Lake, and demonstrated occupation of the area from Shield Archaic and Laurentian Archaic times to the historic period (Noble 1980).

During 1979, 1980, 1981 and 1982, the writer undertook further fieldwork on the Ontario side of Lake Abitibi and also analyzed portions of the existing Jordan's collections from the Jordan (DeHa-8) and Jessup sites (DdGw-2). All known sites for the Ontario portion of the lake are listed in Table 6 of this thesis and illustrated on Figure 3.

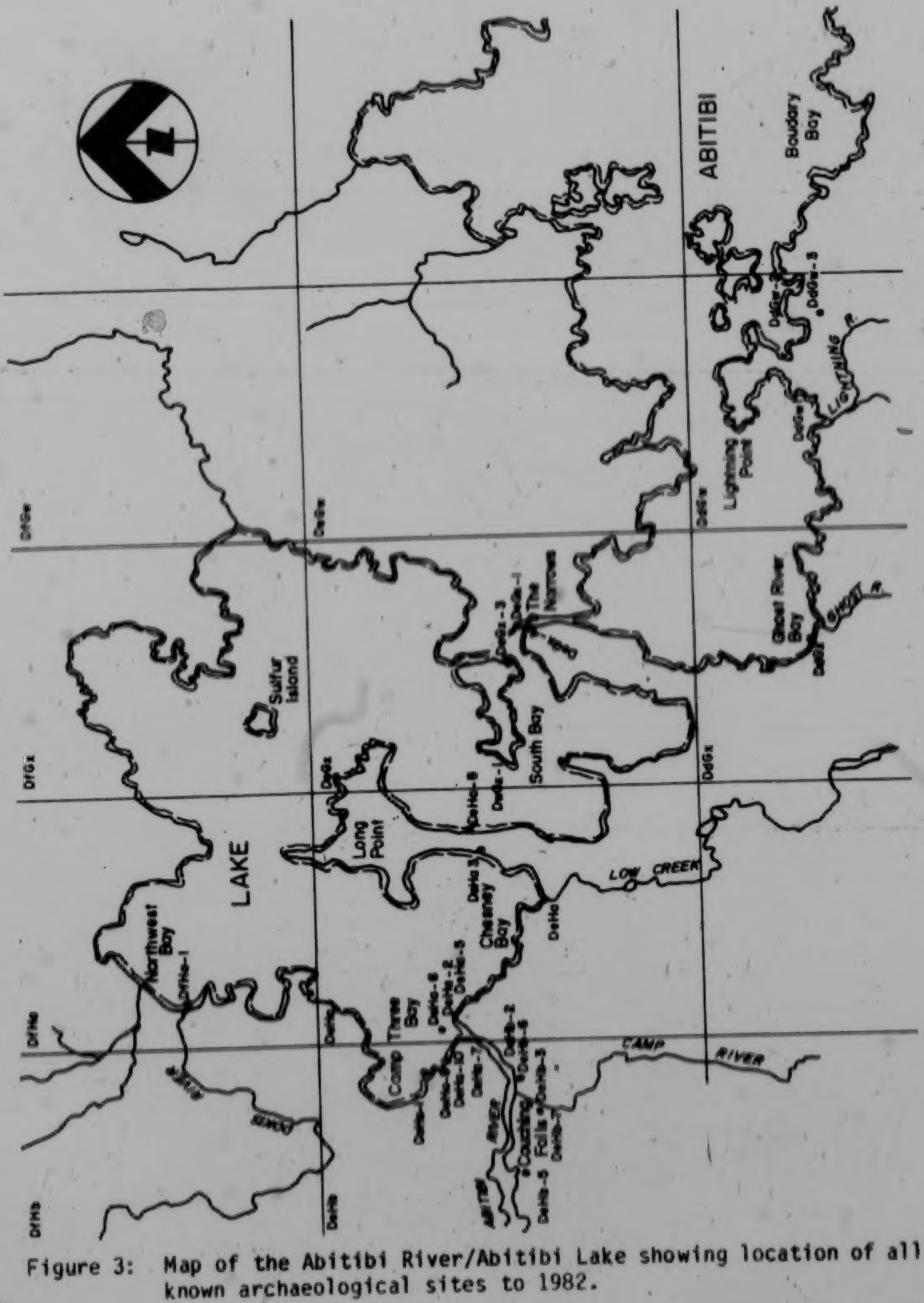

ABITIBI
LAKE
Boudary Bay
Lightning Point
Ghost River Bay
The Narrows
South Bay
Sulfur Island
Long Point
Northwest Bay
Cheesey Bay
Three Bay
Camp
Couching Falls
LOW CREEK
CAMP RIVER
LIGHTNING R.
GHOST R.
ABITIBI RIVER
DfGw
DfGx
DfHa
DfHb
DeGw
DeGx
DeHa
DeHb
DdGw
DdGx
DfHa-1
DeGx-1
DeGx-3
DeHa-3
DeHa-5
DeHa-6

Figure 3: Map of the Abitibi River/Abitibi Lake showing location of all known archaeological sites to 1982.

Table 6: Distribution and Description of All Recorded Prehistoric Archaeological Sites on Lake Abitibi up to 1982

Site Borden #	Environmental Setting	Artifacts	Recorder/ Report Date
DeHb Borden Block			
DeHb-1	long sandy shore backed by terrace	numerous flakes, and artifacts eroding from sand	Jordan, Jordan & Crockatt, 1976
DeHb-2	clay and sand point at Bell River mouth	points, bifaces, flakes, etc.	Jordan, Jordan & Crockatt, 1976
DeHb-3	small sandy point Camp Creek, west side	" "	Jordan, Jordan & Crockatt, 1976; McLeod, 1983 (Settlement Surveys Ltd.)
DeHb-4	Couchiching Falls, north side, small beach above falls	flakes on shore bifaces & cores	Jordans', 1976
DeHb-5	Couchiching Falls, south side small beach backed by bedrock	flakes, bifaces and cores	Jordan, Jordan & Crockatt, 1976
DeHb-6	Bell River, east side	" "	Jordan, Jordan & Crockatt, 1976
DeHb-7	Camp River, east side, sand and clay shoreline	flakes	Jordans', 1976
DeHb-8	on a 20 m high ridge set back 50 m from lake	flakes in test pits, site excavatable	J. Pollock, 1979
DeHb-9 (formerly	on top of a large glacial erratic	area disturbed by pot hunters - archaic flakes and cores	located by Pollock, 1975. Jordan, Jordan & Crockatt, 1976:11. Borden number changed.

Table 6 continued.

Site Borden #	Environmental Setting	Artifacts	Recorder/ Report Date
DeHb-10 (formerly DeHa-10)	west side near Abitibi River source - flat sand terrace	area destroyed by private collectors - archaic site	located by Pollock, 1975. Reported in Jordan, Jordan & Crockatt 1975:12
DeHb-11	Abitibi R. shore, east of Couchiching Falls	end scraper and 10 flakes	McLeod, 1982 (N.B. all of McLeod's sites are reported in Settlement Surveys Ltd.'s 1983 report)
DeHb-12	south side Abitibi River east of Couchiching Falls	biface, side scraper flakes	McLeod, 1982
DeHb-13	above Camp Creek where small stream enters Abitibi River	six flakes	McLeod, 1982
DeHb-14	north shore Abitibi River on a small sand bank	three flakes from test pits	McLeod, 1982
DeHb-15	Abitibi River shore, small rocky point	six flakes	McLeod, 1982
DeHb-16	south shore Camp 3 Bay	seven flakes	McLeod & Pollock 1982
DeHb-17	small embayment north of Bartlett Point	seven flakes	McLeod & Pollock 1982
DeHb-18	long curved sand spit	core, end scraper, Lalonde High Collar pottery - site is excavatable	McLeod & Pollock 1982

Table 6 continued.

Site Borden #	Environmental Setting	Artifacts	Recorder/ Report Date
DeHa Borden Block			
DeHa-1	first point north of the west end of the portage	some doubt as to site location (see McLeod in Settlement Surveys Ltd., 1982:112)	O. L. Hughes, 1958
DeHa-2	on Black's Point near source of Abitibi River	late woodland pottery and lithics - site is excavatable	Ridley, 1956 excavation; Jordan's, 1976; Pollock's 1981 report for evaluation of potential
DeHa-3	at end of portage on a sandy beach, centre of Long Point Peninsula	historic fur trade items and prehistoric biface	Pollock, 1975, reported in Jordan, Jordan & Crockatt, 1976
DeHa-4	east shore of river source to Black's Point - 1 mile of shoreline	artifacts eroding from bank, large numbers of points and specimens	visited by the Jordan's, 1971-79, see 1976 report and 1978 report. Also, McLeod (Settlement Surveys Ltd. 1983)
DeHa-5	southeast beach from Black's - 3 km of beaches	historic and prehistoric artifacts	Jordan, Jordan & Crockatt, 1976; Pollock, 1981:32
DeHa-6	100 m of shore on Abitibi River Island - impacted by camping	2 trihedral adzes	Jordan, Jordan & Crockatt, 1976
DeHa-7	low sand beach backed by swamp	steatite pipe with two hearths (now underwater) - excavatable if above water	Pollock, Conway and Jordan's, 1975 (see Jordan, Jordan and Crockatt, 1976:28)

Table 6 continued.

Site Borden #	Environmental Setting	Artifacts	Recorder/ Report Date
DeHa-8 Jordan Site (formerly DeHa-1)	on low clay shore with large boulders - 70 m of shore continuously under water from 1975 to 1982	cache of bifaces discovered in 1973. Site visited in 1973-74-75-76 and 78 by Jordans. The Jordans collected all material from the site used for John Pollock's dissertation research	Jordan, Jordan & Crockatt, 1976; also Pollock, 1981:32. Above water areas were tested by J. Pollock in 1979 with negative results
DeHa-9	on small bay behind first point - northeast of Bartlett Point	biface, side scrapers, wedge and graver - 26 flakes	McLeod (in Settlement Surveys Ltd., 1982:77)
DeHa-10	on north side of first point northeast of Low Creek	13 flakes	McLeod (in Settlement Surveys Ltd., 1982:110)
DeHa-11	on Low Creek in Chesney Bay along portage trail	9 flakes and iron barrel hoop	McLeod (in Settlement Surveys Ltd., 1982:101)
DeHa-12	rock outcrop along Low Creek	2 lithic artifacts (1 flake)	McLeod (in Settlement Surveys Ltd., 1982)
DeHa-13	east side of the mouth of Low Creek	one flake	McLeod, 1982
DeHa-14	southeast corner of Long Point along a long sand beach	four flakes	McLeod, 1982 (in Settlement Surveys Ltd.'s report)
DeHa-15	southeast side of Long Point near point of land	three flakes	" "

Table 6 continued.

Site Borden #	Environmental Setting	Artifacts	Recorder/ Report Date
DfHa Borden Block			
DfHa-1	on an island off Dokis River mouth	lithic artifacts recovered in 1975 and 1982	Jordan, Jordan & Crockatt 1976:4. McLeod (in Settlement Surveys Ltd.'s report, 1983-82)
DfHa-2	small bay, north of point north of Pierce Bay	four flakes	McLeod-Pollock-Jordans, 1982 in Settlement Surveys Ltd.'s report, 1983:80
DfHa-3	north side of the mouth of Low Bush River, eroding clay bank	adze tip and six flakes	McLeod-Pollock-Jordans, 1982 in Settlement Surveys Ltd.'s 1983 report
DfHa-4	south side of Low Bush River at its mouth on sand beach eroding from bank	points, end scraper, flakes, other lithic tools	as above
DfHa-5	point of land at juncture of Low Bush and Circle Rivers	three flakes	as above
DfHa-6	on MacDougal Point	historic cemetery	as above
DfGx Borden Block			
no sites recorded - area not surveyed			

Table 6 continued.

Site Borden #	Environmental Setting	Artifacts	Recorder/ Report Date
DeGx Borden Block			
DeGx-1 Ridley's Abitibi Narrows Site	Abitibi Narrows Site	Shield Archaic Site - further excavations and protection needed	Ridley, 1954 excavation, Jordan, Jordan & Crockatt, 1976:22. McLeod 1982 in Settlement Surveys Ltd.'s, 1983:144 (also Jordan & Jordan, 1978 report)
DeGx-2	poss. extreme west end of Deer Island	n/a	Jordan, Jordan & Crockatt, 1976 site map (shown as DeGx-1)
DeGx-3	stoney beach with low wooded backshore area	artifacts under water	Jordan, Jordan & Crockatt, 1976:20
DeGx-4	northeast corner of narrows on Dugas beach	numerous prehistoric and historic - poss. trading post location - excavatable	Ridley, 1966:6, Jordan, Jordan & Crockatt, 1976:21, Mike McLeod in Settlement Surveys Ltd.'s 1983:138
DeGx-5	northeast corner of Abitibi Narrows on south side of a large rock outcrop	nine flakes	Mike McLeod 1982 in Settlement Surveys Ltd.'s 1983 report to M.N.R.
DeGx-6	northeast side of Abitibi Narrows on a small washed out rocky point	1 point, 2 bifaces, 2 scrapers, 25 flakes, historic materials	" "

Table 6 continued.

Site Borden #	Environmental Setting	Artifacts	Recorder/ Report Date
DeGx-7 Biederman Site	southwest corner of Abitibi Narrows	location of Biederman's 1890 to 1907 Store and a large, rich prehistoric site - excavatable	Mike McLeod 1982 in Settlement Surveys Ltd.'s 1983 report to M.N.R., p. 163
DeGx-8	small bay on north end of McDougal Point	two flakes	McLeod 1982, in Settlement Surveys Ltd.'s 1983 report
DeGx-9	small bay at northeast entrance to Abitibi Narrows	1 end scraper, 1 side scraper, 28 flakes	" "
DeGx-10	southeast corner of Abitibi Narrows facing the lake	3 side scrapers, 24 flakes	Mike McLeod 1982 in Settlement Surveys Ltd.'s 1983 report to M.N.R.
DeGx-11	southeast corner of the Abitibi Narrows - 350 metres of shoreline	3 bifaces, adze tip, side scrapers, 13	N.B. McLeod has named this the Ridley Site in honour of Frank Ridley. Ridley however, never recorded or worked at this site. See McLeod in Settlement Surveys Ltd.'s 1983 report, page 157
DeGx-12	east side of Abitibi Narrows in the Centre of Narrows on small rocky knoll	1 point, 4 bifaces, 1 end scraper, 2 side scrapers, 2 cores, 21 flakes (may be excavatable)	McLeod 1982 in Settlement Surveys Ltd.'s 1983 report

Table 6 continued.

Site Borden #	Environmental Setting	Artifacts	Recorder/ Report Date
DeGx-13	west side of Abitibi Narrows where a small stream enters an embayment	1 biface, 1 side scraper, 18 flakes (may be excavatable)	McLeod 1982 in Settlement Surveys Ltd.'s 1983 report
DeGx-14	northeast corner of South Bay on an island (a washed out beach)	three flakes	" "
DeGx-15	on island in the northeast corner of South Bay	14 flakes	" "
DeGx-16	small sheltered sandy bay, N.E. corner of south bay	three flakes	" "
DeGx-17	beach in a west facing bay south of 2nd point S.W. of McDougal Point	1 biface, 1 scraper, 1 drill, 92 flakes (more specimens may be under water)	" "
DeGx-18	beach in a northwest facing bay south of first point of land south of McDougal Point	3 points, 4 bifaces, 5 scrapers, 244 flakes, etc. (probably a large but submerged site)	" "
DdGx Borden Block			
DdGx-1 Ghost River Island and Beach	north point of west shore of river mouth and beach on island facing mainland	prehistoric lithics and ceramics, historic material as well	Ridley excavated here in 1955. Jordans visited in 1973, 74 and 75. See Jordan, Jordan and Crockatt 1976:24

Table 6 continued.

Site Borden #	Environmental Setting	Artifacts	Recorder/ Report Date
DdGw-1 Borden Block			
DdGw-1	Lightning River mouth small rocky point on west side facing east and east side of clay bank	5 biface fragments, 3 unifaces, 3 scrapers, 3 cores, 9 utilized flakes, 21 flakes	visited for 3 hours by Jordans in 1973. Reported in Jordan, Jordan & Crockatt 1976:26
DdGw-2 Jessup Site	at the bottom of Lower Bay next to the east base of Lightning Point site extends for circa 2.5 km. Other than at extremely low water levels, most of the site is submerged	there are literally tons of artifacts on this major lithic workshop site. Most materials remain under water. The Jordans have a large collection used for John Pollock's dissertation research	first located by the Jordans and Jessups in 1976 (see Jordan & Jordan, 1977 report). Extremely low water levels in 1977 allowed for a large collection of materials to be made by the Jordans (see their 1977 report). In 1978 the site was flooded and has been from 1978 to 1982. During 1979 Ingrid Kritsch-Armstrong excavated a small portion at the extreme eastern end. J. Pollock visited the site in 1979 (see Pollock's 1981 report) and again in 1982.

Table 6 continued.

Site Borden #	Environmental Setting	Artifacts	Recorder/ Report Date
DdGw-3 Mt. Goldsmith Quarry Site	site is situated on a separate outcrop along the flank of Mt. Goldsmith. Surface collecting area for lithic raw material and possible bedrock quarrying by prehistoric peoples	quarry detritus and core fragments	first located by John Pollock and geologist Larry Jensen in 1980. Explored in 1981 and excavated and mapped in 1982 by John Pollock (see Settlement Surveys Ltd.'s 1983 report to M.N.R. appendix)

CHAPTER III

GENERAL GEOLOGY OF LAKE ABITIBI AND THE MOUNT GOLDSMITH QUARRY SITE (DdGw-3)

Introduction

The geology of the Lake Abitibi region (see Figure 4) is important to the archaeological problems raised in this thesis for several reasons. Firstly, the deglaciation of Wisconsin ice puts a time limit on the earliest occupations of the area. Also important in regards to early settlement are two Pleistocene events, namely the Cochrane readvance of Wisconsin ice; and the formation of glacial Lake Barlow-Ojibway, which lasted for some 2,000 years. The Mount Goldsmith Quarry site may have been on an island in this glacial lake. A final and extremely important factor is the Precambrian bedrock. A unique formation of cherty tuff situated between ancient Archean lava flows provided a source of lithic material for aboriginal stone tool manufacture.

In this chapter a general discussion of the glacial and early history of the area is presented in section one, followed by a general bedrock geology discussion in section two, and finally in section three, details of the geology at the Mount Goldsmith Quarry Site (DdGw-3).

Part One: Glacial History of Lake Abitibi and Quaternary Geology

The Late Glacial period begins with the Wisconsin ice retreat from the area. Once thought to have been about 10,000 B.P. (Terasmae & Hughes 1960:a & b; Terasmae 1962:4), recent evidence has indicated an earlier time frame. During deglaciation large meltwater lakes were impounded between the northward receding glacier and the former Arctic Ocean/St. Lawrence River drainage divide. Subsequent isostatic uplift has shifted this divide northward. The levels of the various impoundments which ended with glacial lake Barlow-Ojibway were determined by "differential isostatic uplift and fluvial downcutting of these outlets" (Vincent & Hardy 1979:1). Previous research had placed the existence of Glacial Lake Barlow-Ojibway from 9,000 to 7,000 B.P. with final drainage taking place by 6,000 B.C. (Terasmae 1962:37).

More recent research by Vincent and Hardy has indicated that at the time of deglaciation the water level in the glacial lake was about 355 to 380 metres (1,164.4 feet) above sea level. A height of 355 metres would mean that only the uppermost reaches of Mount Goldsmith at a height of 396.8 metres (1301 feet) would have been an island in the glacial lake, at times completely submerged when levels reached the 380 metre level (Jensen 1978:27 in Kritsch-Armstrong 1982:31). Vincent and Hardy (1979:17) feel drainage of the glacial lakes took place some 7,900 years ago. This then would set the earliest date for occupation of the lake bed by prehistoric peoples. Of importance to regional early man studies is the fact that much earlier, Lake Barlow had become separated from Lake Ojibway by the water free Angliers sill (Vincent & Hardy 1979:Fig. 36, p. 15). As mentioned, it is important to date the drainage of the glacial lakes in the region in order to date the earliest possible age of occupation for sites on the former lake beds. However, it is also a distinct possibility that man was living along its shorelines and on islands in the area before drainage of the glacial lakes. Thus, there are two critical geological dates; the initial retreat of the ice from the land and the final drainage of the post-glacial meltwater lakes. According to Hillaire-Marcel and Vincent (1980:48) the date for initial deglaciation of the Lake Abitibi area is between 9,500 - 9,000 years B.P., with the Cochrane readvance of ice (just north of Lake Abitibi) dating to 8,500 - 8,000 years B.P. Glacial Lake Ojibway existed in the area for about 1,600 years, with final drainage taking place about 7,900 B.P. Thus, the Jordan and Jessup sites located on the bed of the proglacial Lake Ojibway should not date earlier than 7,900 yrs. B.P. Any possibility of earlier sites would depend on a few restricted localities, such as Mt. Goldsmith which may have been islands in the glacial lake. Sites on these restricted areas could date as early as 9,500 yrs. B.P. Also of concern would be fluctuations in the level of modern Lake Abitibi. Hughes suggested (1955:39) that at some time in the past modern Lake Abitibi may have existed at a higher level. The terraces of this lake, if they can be identified, may be of use as well in dating archaeological sites. A summary of the glacial chronology is provided in Table 7. The dates listed above are about 1,000 years earlier than those formerly postulated for the area (see Pollock 1976:11).

There are conflicting data regarding paleo-environmental flora and climate. Northeast of the Abitibi area in Quebec a transect of five radiocarbon-dated pollen diagrams from lake sediments showed that the

Table 7: Glacial Chronology

Time	Event	Climate	Flora
8000 - 7000 B.C. (10,000 - 9,000 B.P.)	Retreat of ice north of Lake Abitibi	arctic and sub-arctic	predominantly aspen
7000 B.C. (9,000 B.P.)	Glacial Lake Ojibway forms	sub-arctic	aspen with black spruce and jackpine
6500 - 6000 B.C. (8,500 - 8,000 yrs. B.P.)	Cochrane I & II Glacier ice readvance (does not cover Lake Abitibi	sub-arctic	dominated by aspen as above
5900 - 5250 B.C. (7,900 - 7,250 yrs. B.P.)	Draining of Glacial Lake Ojibway	close to modern climatic conditions?	black spruce, jack-pine, balsam fir and white birch
5250 - 4000 B.C. (7,250 - 6,000 yrs. B.P.)	Water levels lower than modern level?	warmer and drier than present	Great Lakes Forest, closed forest beginning and climax of white pine (Pinus strobus)
4000 - 1250 B.C. (6,000 - 3,250 yrs. B.P.)	more open vegetative cover	warmer & drier than present	Great Lakes & Boreal Forest, open forest with juniper (Juniperus) and alder (alnus crispa)
1250 B.C. to Present (3,250 yrs. B.P. to Present)	modern drainage systems	modern climatic conditions (see Table 3)	Boreal Forest with a few remnant Great Lakes species in sheltered areas

initial landscape following deglaciation was a quasi desert rapidly followed by an Aspen Parkland (Populus) and an open spruce (Picea mariona), alder (Alnus crispa) and dwarf birch (Betula glandulosa) woodland. About 2,700 B.P. the present day forest stabilized (Hillaire-Marcel and Vincent 1980:133). As the above area, situated between latitudes 53 and 55 degrees, is considerably north of the study area (between latitudes 45 and 50) and is located to the east of the James Bay lowlands in contrast to Lake Abitibi located south of the lowlands, the climate and flora could have been quite different in the Lake Abitibi region.

Of considerable importance are early paleo-environmental data collected by Marois from pollen cores obtained at Lake Cleo and Yelle, 10 km south of Lake Abitibi, and analyzed by Pierre Richard (Kritsch-Armstrong 1982:33). Data from this study indicates that trees were growing along the southern shore of the glacial lake even as the north shore was a solid wall of retreating glacial ice. The early colonizers were predominantly aspen (Populus tremuloides) along with black spruce (Picea mariana) and jackpine (Pinus divaricata). These species, together with balsam fir and white birch, spread over the freshly drained glacial lake bottom and covered it for a 500 year period following glacial lake drainage about 7,900 yrs. B.P.

As indicated in Table 7, during this short period climatic and flora conditions may have been close to modern day circumstances, although during this short early period (7900 - 7200 yrs. B.P.) megafauna such as mastodon (Mammut americanus) may have found this to be a refugium area. Mastodons in North America lived in cool temperate conifer and mixed forest zones along with caribou and moose.

Following the initial establishment of vegetation on the exposed glacial lake bottom, a warmer and drier period is indicated by the establishment of a white pine (Pinus strobus) forest on suitable sites from 7,200 - 6,000 yrs. B.P. followed by a more open forest cover with climatic conditions around 3,250 yrs. B.P. (Richard 1979 in Kritsch-Armstrong 1982:35). In contrast to Kritsch-Armstrong's statement that the warmer and drier period lasting some 4000 years from circa 7,200 - 3,250 B.P. probably did not cause environmental changes that would force environmental adjustments on prehistoric peoples (Kritsch-Armstrong 1982:36), one could take the alternative view that these changes may have had a very great effect.

In summary, the late glacial and post-glacial history and chronology dictates not only the earliest date for initial occupation of the area by aboriginal peoples but also indicates a number of environmental shifts that may have been reflected in the culture of peoples resident in the area. There may be a possibility then, that these environmental shifts are reflected by technological differences in the prehistoric lithic tool kits.

As dating of the glacial events in the area becomes more refined, the trend is clearly toward an earlier rather than later initial deglaciation of the study area. A recent minimum deglaciation date for the Larder Lake area just south of Lake Abitibi, taken on a sample of organic material at the base of a four-metre section, shows the area to be ice free at 9,990 +/- 260 yrs. B.P. (Cameron Baker, Ontario Geological Survey: 1980 map sheet 2381). With a minimum date for deglaciation of 8000 B.C. there is ample time to postulate late Paleo-Indian or Plano occupations in the area. Clearly, further paleo-environmental work is needed, especially radiocarbon dated pollen cores, so that the dates for potential occupation by man, plants and animals and their environmental contexts can be precisely delineated and related closely to the archaeological record.

Quaternary Geology - Surficial Deposits

Pioneering work on the surficial geology of the area (Figure 4) was undertaken by Owen L. Hughes (1955) and A. N. Boissonneau (1965). More recently, E. D. Frey (1975, 1976) and Cameron Baker (Baker et al. 1980) have continued research into the Quaternary geology of nearby Shield and lowlands areas. To date, however, Hughes is the only researcher to have undertaken field research within the specific area under discussion (Figure 4).

Although the final known re-advance of the Wisconsin glacier occurred just to the north of the study area and may even have reached the north shore of Lake Abitibi (Larry Jensen: personal communication), as yet, no evidence has been found for Cochrane till (see Table 8) of the North Driftwood Formation (Hughes 1959 & 1965, INQUA 1977) dating to the Driftwood Stadial (time of the last ice re-advance) existing on the south shore of the lake. Thus, it is entirely possible that early aboriginal sites and post glacial Lake Barlow-Ojibway deposits were not disturbed by the Cochrane re-advance, dated at circa 8,000 years B.P. The re-advance of the ice sheet is thought to have a duration of about 300 years (Terasmae & Hughes 1960, Hughes 1965, Skinner 1973).

One of the most important depositional factors affecting surficial deposits in the study area was the proglacial Lake Barlow-

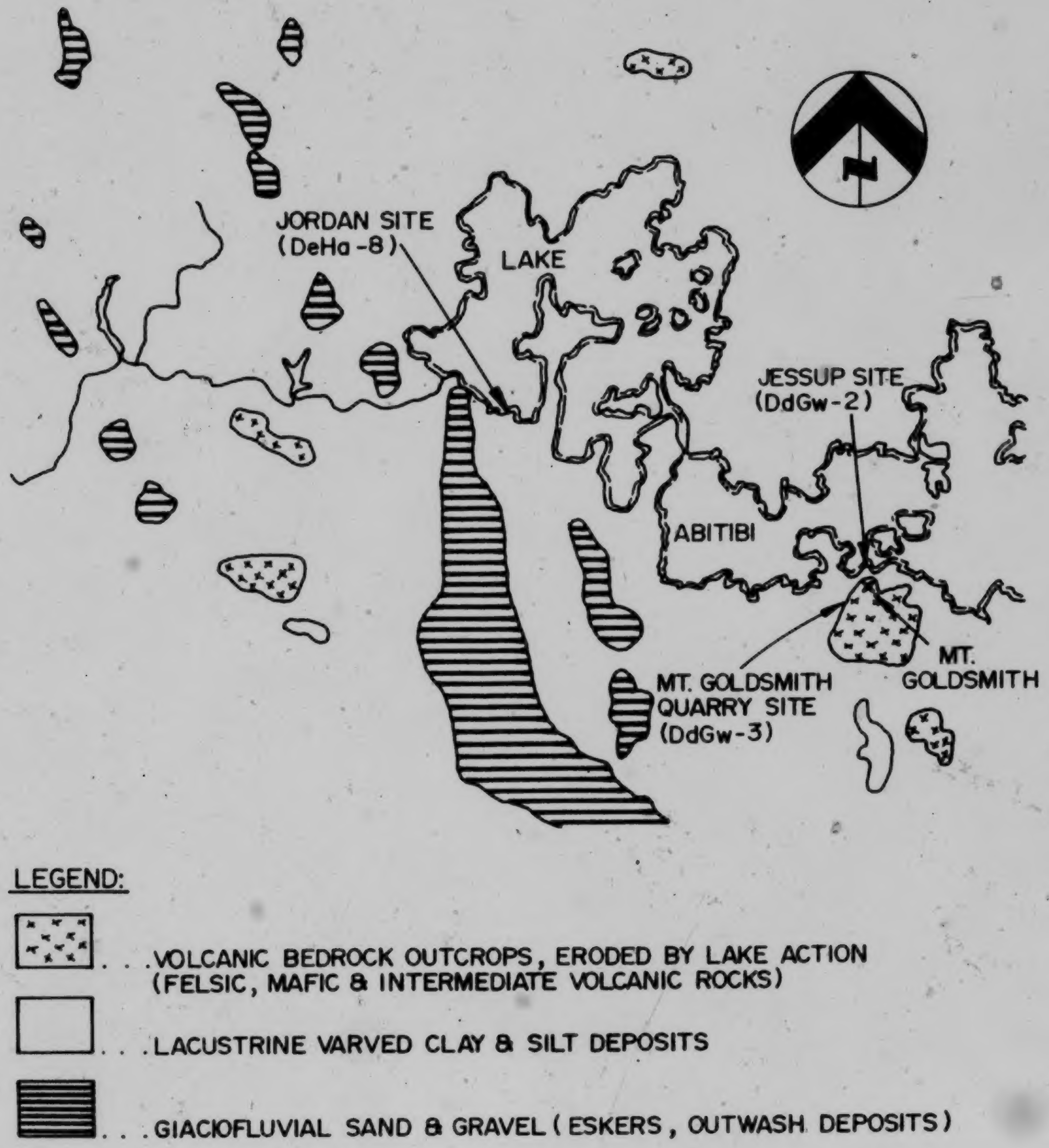

JORDAN SITE
(DeHa-8)
LAKE
ABITIBI
JESSUP SITE
(DdGw-2)
MT. GOLDSMITH QUARRY SITE
(DdGw-3)
MT. GOLDSMITH
LEGEND:
. . .VOLCANIC BEDROCK OUTCROPS, ERODED BY LAKE ACTION (FELSIC, MAFIC & INTERMEDIATE VOLCANIC ROCKS)
. . .LACUSTRINE VARVED CLAY & SILT DEPOSITS
. . .GLACIOFLUVIAL SAND & GRAVEL (ESKERS, OUTWASH DEPOSITS)

Figure 4: Generalized surficial and bedrock geology of study area.

Table 8: Table of Geological Units
Frecheville Township and Area, Lake Abitibi

CENOZOIC

Postglacial and Recent

Colluvium (slope deposits) – sand, gravel, cobbles

Alluvium (includes beaches on Lake Abitibi) – silt, fine sand, storm beaches present day Lake Abitibi

Organic sediments (bogs) – peat, carbonaceous mud

Pleistocene

Barlow-Ojibway Formation:

Glaciolacustrine Sediments - (1) varved clay deposited on the lake bottom.
(2) shore and near shore deposits, sand, boulders and cobble beach deposits, etc., stratigraphically higher than unit one above. North-south trending.

Glaciofluvial Sediments - sand and gravel eskers; cobbles, outwash plains.

Matheson Formation:

Till Deposit - sandy with assorted boulders, pale blue-grey, weathering to pale grey-brown, friable flakey texture; lens of silty gravel near top. Forms an almost continuous sheet in the region.
- lenses of gravel and sand in till.

- Unconformity -

* There is no evidence at present that the area was ever covered by the Cochrane readvance (Hughes 1950:42), or also known as the Driftwood Stadial (Dreimanis & Karrow 1972); the last major southward readvance of the Wisconsinan Continental glacier.

Table 8 continued

Unnamed Formation:

Till - unconfirmed remnant tills from other glaciations may be present in deeply buried valleys.

- Unconformity -

PRECAMBRIAN

Early Precambrian (ARCHEAN)

Felsic Intrusive Rocks
- feldspar porphrydikes
- hornblende - feldspar porphrydikes
- lamprophyre

- Intrusive Contact -

Mafic and Intermediate Intrusive Rocks - gabbro and quartz gabbro diorite.

- Intrusive Contact -

Felsic Volcanic Rocks
- massive rhyodocite and rhyolite
- rhyolite breccia
- rhyolite tuff
- rhyodocite and rhyolite with quartz phenocrysts
- * - cherty bedded rhyodocite and rhyolite
- rhyodocite and rhyolite dikes

Intermediate Volcanic Rocks
- andesite and dacite, pillow flows, tuffs
- argillite and graphitic sedimentary rocks
- andesite and dacite dikes

Mafic Volcanic Rocks - massive basalt and andesite, pillow lavas, basalt and andesite tuff-breccia

---

(The above Table is taken from: Frey 1975, 1976; Hughes 1955; Lumbers 1962; and L. S. Jensen 1972).

* Source of aboriginal lithic material for stone tool manufacturing.

Ojibway which existed for some 2,000 years from inception to drainage (Terasmae and Hughes 1960:1446). During that time the lake laid down major bottom deposits of glaciolacustrine sediments, mainly thick accumulations of varved clays and silts. Hughes noted that where the Barlow-Ojibway varved clay is exposed, varves are not always recognizable in the upper metre or so of the deposit, because they were obliterated by soil forming processes and/or wave action (Hughes 1965:38).

Remnant beach ridges of sand and cobbles are also present. These would be of interest for early man sites in the area. It is quite possible that the Ghost Range and specifically Mt. Goldsmith (elevation 396.8 m; 1,301 feet) (Figure 4) was an island in the glacial lake. Therefore, early man sites may be located along former shorelines of the island at some distance from present day Lake Abitibi. As the chert source is located on these islands and Mt. Goldsmith specifically, possibly early peoples (travelling by water) utilized these flakable rocks.

Also of significance are the glaciofluvial sand and gravel eskers and broad outwash plains or sand deltas. Several eskers (steep sided ridges of sand and gravel) are present west of Mount Goldsmith and south of Lake Abitibi (Figure 4). Eskers have a distinctive profile characterized by undulating high nodes and low saddles with nodal crests high above the surrounding topography (Frey 1976:13). These landforms would have served as possible travel routes for early peoples and large ungulates such as moose and caribou.

A stratigraphic sequence is available for the south shore of Lake Abitibi, between the Jordan and Jessup sites on the west side and 1.93 km (1.2 miles) south of Long Point. From the lake level up there is sandy clay, greasy blue-grey clay, and dark grey clay containing shells of freshwater mollusks. These are overlain by 17 feet (5.2 m) of Barlow-Ojibway sand and gravel (Hughes 1955:38). Hughes comments that the massive post-glacial clay "appears to record a somewhat later stage than does the unvarved silty clay . . . perhaps a stage in which Lake Abitibi existed as a separate glacial lake but at a level above the modern one" (Hughes 1955:39). The foregoing is significant as regards early sites and settlement patterns in the area. Again, if Hughes is correct very early sites could be situated on high terraces around the lake. Thus, not only may former shorelines of the glacial Lake Barlow-Ojibway yield early human occupation sites, but former shorelines of a much larger Lake Abitibi may also be present, with sites situated on an intermediate shoreline between the early glacial lake shoreline and more recent modern shoreline. Such terraces or shorelines have not yet been recorded for the area and therefore, precise identification of these features (if they are present) awaits further geological research.

The oldest tills in the study area, lying below the glacio-fluvial sediments are tills of Wisconsin age including the Matheson Formation (Hughes 1965:10), the oldest known surficial unit in the study area. It "occurs as an almost continuous sheet in the region at the surface or beneath younger deposits, except for local discontinuities over bedrock hills" (Hughes 1955:11). In many areas the Matheson Formation lies beneath the varved clays of the Barlow-Ojibway Formation. The Matheson Formation in places contains large boulders and rocks derived from underlying Precambrian bedrock. It is also possible, but not confirmed, that some still older tills may be present in buried valleys.

As mentioned, Hughes is the only geological researcher to have undertaken extensive field work in the surficial geology of the immediate study area (Figure 4), and therefore the available surficial data is largely restricted to this one reference source.

Part Two: Bedrock Geology of Lake Abitibi

The Canadian Shield is one of the world's largest exposures of Precambrian rock, and one of the oldest and most stable bedrock areas in existence. The Canadian Shield, centered around Hudson's Bay, is comprised of seven structural provinces and thirty-four subprovinces (based on differences in folding, structural, and age aspects) (Stockwell et al. 1970:45, 46).

The geological study area of this thesis (Figure 4) is located in the Superior Province and more specifically in the Abitibi Belt Subprovince. The Archean rocks in the area include metavolcanic, metasedimentary and plutonic rocks accompanied by minor Proterozoic Sediments and igneous rocks (see Table 8). The area is noted for its large and rich mineral deposits centered near the present day mining communities of Timmins, Kirkland Lake and Rouyn-Noranda (Goodwin 1980:44).

One of the earliest geological descriptions of Lake Abitibi is provided by Walter McQuat of the Geological Survey of Canada, who conducted a micrometer survey of the lake in July 1871. His description of the lake is of some interest, for it dates before the waters were artificially raised .91 m (3 feet) by the Abitibi Pulp and Paper Co. dam on the Abitibi River at Iroquois Falls. According to McQuat, the lake at that time was thirty-three miles long and two to eight miles wide,

> . . . except a little to the eastward of the middle, where a bay extends eight or ten miles to the north, and another bay directly opposite increases the width of the lake two or three miles southward, giving the upper lake a total width here of about seventeen miles. . . . The shoreline in both lakes is exceedingly irregular and the number of islands in all parts is very great.
> (McQuat 1873:126)

In describing the rock formations of the area he mentions that:

> The rocks belong to the same two classes met with farther south. Gneissoid and granitic rocks occur all along the north side of the upper, and on the southeast side of the lower lake, while the other portions of both are occupied by micaceous, hornblendic, and chloritic schists, fine grained hard quartzites, diorites, and dioritic schists, with serpentines.
>
> (Ibid. 126)

Also of note relative to this dissertation are the hills of "light greenish-grey compact diorites" mentioned by McQuat (1873:128). These are no doubt the hills of the Ghost Range (Figure 4). In regard to these hills he mentions that,

> They are precisely similar in appearance, and from one of them which was ascended, and which rises to a height of about 400 feet above the lake, the country was studded with them as far as the eye can reach, looking southward as well as east and west.
>
> (Ibid. 128)

The rocks of the Abitibi region are entirely Precambrian in age (Table 8) (Lumbers 1962:6). According to Lumbers (1962:6, 7), they "comprise a complex of metavolcanic and metasedimentary rocks intruded by sills, dikes, stocks and batholiths that vary widely in composition and age." The volcanic rocks in the area are related to individual volcanic eruptions which were close-spaced fissure controlled vents (Goodwin 1980:46). The rocks are typically basalt lava and associated gabbro intrusions, overlain by more andesitic flows, tuffs and breccias. Felsic volcanic rocks such as rhyolite and dacite are common in upper lava flows. Interflow material is generally sparse but in certain areas such as the Mt. Goldsmith quarry site, chert and iron formation sediments are present between the flows (Goodwin 1980:44; Jensen 1972). These rocks though of limited areal extent (Plates 1 and 2) are most important because they contain a lithic raw material suitable for prehistoric stone tool manufacture.

In regards to the specific bedrock geology in the vicinity of the Mount Goldsmith and Jessup archaeological sites, the bedrock consists of the Kinojevis Group volcanic bedrock formation, comprising:

> . . . mafic and intermediate volcanic rock intercalated with thin units of jaspilite and graphitic chert and argillite. Gabbro and dorite intrude the volcanic rock . . . and a few dikes of feldspar porphry cut the volcanic rock near the southern shore of Lake Abitibi . . . along the southern shore of Lake Abitibi . . . the rocks are altered to upper green-schist facies of metamorphism along narrow shear zones and near feldspar porphry dikes.
> (Jensen 1972: Preliminary Map p. 823, and 1978:234)

Within the above formations, the specific occurrence of the cherty or welded tuffs suitable for aboriginal tool manufacture has been also described by Jensen as follows:

> . . . finely laminated cherty tuffs were noted between the lava flows. In the north, in the lower parts of the volcanic sequence, the cherty tuffs are associated with magnetite and jasper. Higher in the volcanic sequence, the cherty tuffs are associated with argillite and graphite.
> (ibid. 1972)

Jensen also states that three volcanic rock sequences are present in the area. The archaeologically important Kinojevis Group (4000 metres thick) contains, within its lower 1000 metres, "interflow units of tuff breccia, crystal tuff and cherty tuff of cale-alkalic dacite and rhyolite composition, as well as chert, argillite, graphite and cherty oxide iron formation" (Jensen 1981:234 in Kritsch-Armstrong 1982:45). The term "cherty" or "welded tuff," can also be used as a composite term to include other possible materials for prehistoric use such as andesite and dacite tuff, cherty bedded rhyodacite and rhyolite. These are about 2,719,000,000 years old (Kritsch-Armstrong 1982:47). All the above are found relatively close together within the Kinojevis volcanic group.

The significance of the bedrock geology to the prehistoric peoples is explored in the following and final section of the chapter.

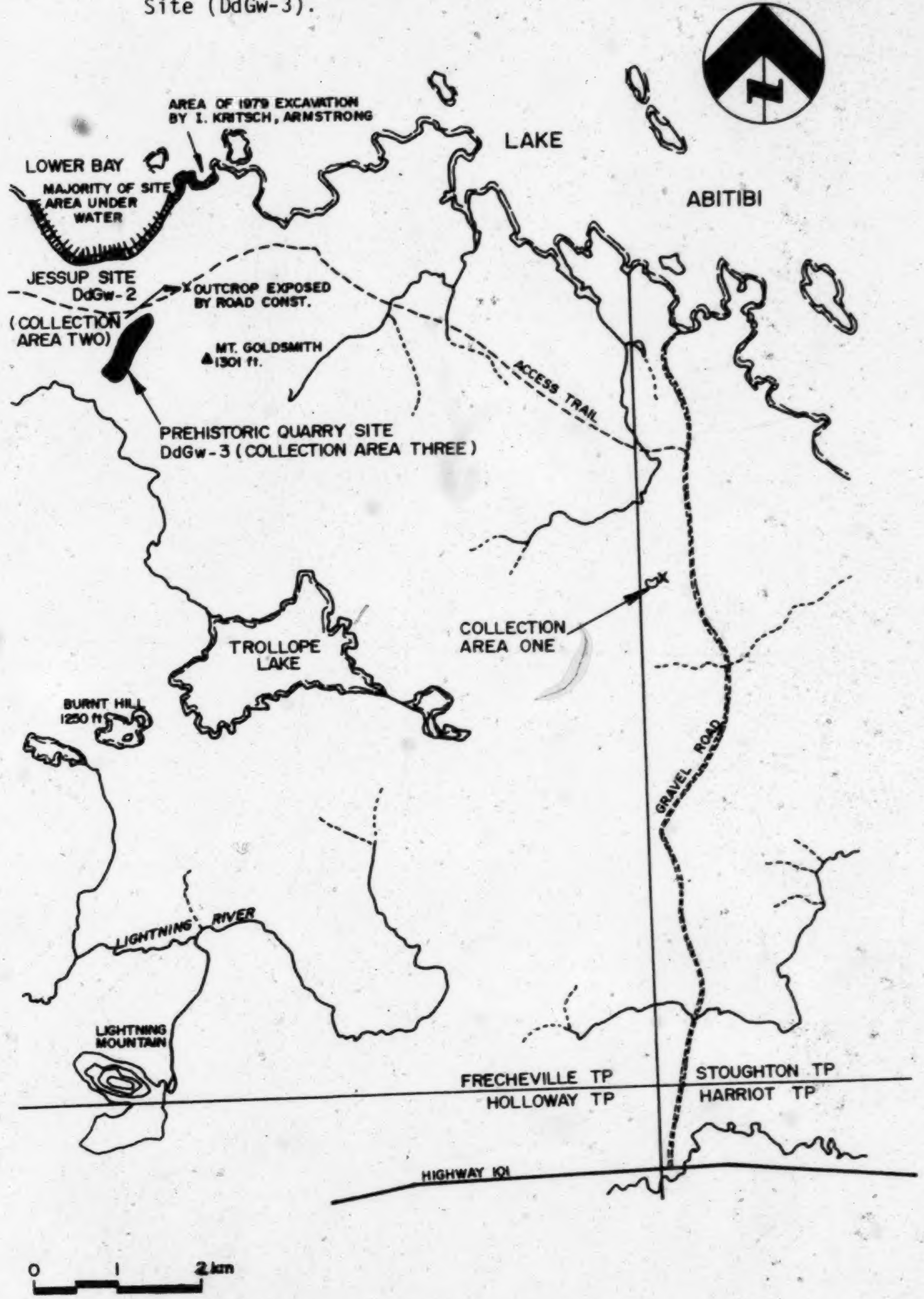
Part Three: Geology of the Mount Goldsmith Prehistoric Quarry Site (DdGw-3)

Of importance to this dissertation is the previously described Kinojevis formation which supplied the aboriginal flintknappers of the area with a source of raw material for stone tool manufacturing.

During August 1980, I was fortunate to meet Mr. Larry Jensen, a Geologist with the Mines Division of the Ministry of Natural Resources. Mr. Jensen conducted geological mapping in Stoughton and Frecheville Townships during 1972 (Figure 5), and completed his Ph.D. thesis on the area during 1981. With the assistance of Mr. Jensen and his field crew we were able to relocate in the field the "cherty welded tuff" rock formation that extends for about 12 km in a 'V' configuration through Stoughton and Frecheville Townships and outcrops at only seven places on the surface (Larry Jensen: personal communication) (see Figure 8). This deposit is composed of silicious volcanic ash deposited in graded beds (not thicker than one or two metres and averaging much less). The ash was deposited between lava flows, and now has the physical properties of a medium to fine grained green chert. The formation forms a 'V' shape with the bottom of the 'V' extending to within 2,000 feet (610 m) of the lake. Close to the lake, the "welded tuff" is associated with a thin (10 cm thick) band of magnetite and red jasper. The laminated chert formation is unique to this one small area and indeed rare even on a world wide basis (Larry Jensen: personal communication).

The formation containing the welded (laminated) tuff comes closest to the lake at the Mt. Goldsmith quarry site outcrop (Figure 5). There are no exposures closer to the lake. During 1982, we checked the

Figure 5: Map of Mt. Goldsmith and area showing the Prehistoric Quarry Site (DdGw-3).


AREA OF 1979 EXCAVATION BY I. KRITSCH, ARMSTRONG
LAKE
ABITIBI
LOWER BAY
MAJORITY OF SITE AREA UNDER WATER
JESSUP SITE DdGw-2
(COLLECTION AREA TWO)
OUTCROP EXPOSED BY ROAD CONST.
MT. GOLDSMITH 1301 ft.
ACCESS TRAIL
PREHISTORIC QUARRY SITE DdGw-3 (COLLECTION AREA THREE)
COLLECTION AREA ONE
TROLLOPE LAKE
BURNT HILL 1250 ft
GRAVEL ROAD
LIGHTNING RIVER
LIGHTNING MOUNTAIN
FRECHEVILLE TP
HOLLOWAY TP
STOUGHTON TP
HARRIOT TP
HIGHWAY 101
0
1
2 km

outcrops between the Mt. Goldsmith quarry and the lake, but no further outcrops of welded tuff (green laminated chert) were located and none of the rock formations between the quarry and the lake contain material suitable for stone tool manufacture. It is the writer's opinion that other aboriginal quarry locales may exist in the area but that these are at a greater distance from the lake.

During 1980, for the purposes of conducting the cognitive lithic experiments utilized in this thesis, three outcrops were examined and a large collection of raw material was made from two non-aboriginal utilized outcrops and loose pieces of non-utilized material from the actual quarry site area (see Table 9 and Figure 5) for replicative experimental lithic work. Larry Jensen assisted the writer in collecting these samples.

The third group of three outcrops visited (Figure 5) was the Mount Goldsmith Quarry Site (DdGw-3) close to the flank of Mount Goldsmith (elevation 1,301 feet) on a high outcrop and within visible distance of the Jessup lithic workshop site (Plate 3). During the 1980 examination, I did not have sufficient time to conduct extensive subsurface testing nor were any archaeological specimens collected. Some surface raw material for experimental purposes was taken from non-aboriginal altered portions of the rock outcrop as documented in Table 9.

In order for rock materials to be suitable for tool manufacture or for experimental flintknapping, they must possess a number of characteristics such as a concoidal fracture. For the prehistoric knapper, aside from favoured materials obtained by trade, the vast majority of materials were obtained locally or regionally. Thus,

Table 9: Source of Raw Material for Experimental Artifacts

Specimen #	Outcrop #1	Outcrop #2	Outcrop #3
AB1	-	-	-
AB2	-	+	-
AB3	+	-	-
	(not used)		
AB4	-	-	-
AB5	+	-	-
AB6	+	-	-
AB7	+	-	-
AB8	-	-	+
AB9	-	+	-
AB10	+	-	-
AB11	+	-	-
AB12	-	-	+
AB13	-	-	+
AB14	+	-	-
AB15	+	-	-
AB16	+	-	-

N.B. Locations of above areas are shown in Figure 7.

depending on the area, prehistoric peoples used chert, flint, argillite, silicified siltstone (greywacke), quartzite, chalcedony, obsidian, basalt, quartz or any other hard, fine grained, siliceous rock exhibiting a concoidal fracture. An important distinction has been made, however, by R. Bonnichsen who states:

> . . . there are two major classes of brittle solids: crystaline and amorphous . . . . Amorphous materials used in tool making such as obsidian, are isotropic and have the same properties in all directions . . . crystalline materials (such as quartzite) have different properties in different directions (i.e., along bedding planes) and are called anistropic. (Importantly) . . . the same body of theory can be used to explain fracture features in both isotropic and anisotropic materials.
> (Bonnichsen 1977:94)

The welded (cherty) tuff used by the prehistoric peoples of Lake Abitibi and also used for the experiments undertaken as part of this thesis is an anisotropic material in that it has very distinctive bedding planes. Within the cherty interflow formation and in related andesite, dacite and cherty rhyodacite zones there are, however, a number of distinct grades of material in regards to grain size, degree of silica present and ease of working. At the centre of the laminated chert formations are thinly bedded laminates (see Plate 2) of a pale to dark green fine-grained elastic chert.

In regard to prehistoric exploitation of the chert formation of the quarry site, the quarry is located within visual sight of the Jessup lithic workshop site (Plate 3, Figure 5) as speculated upon long before discovery by the Jordans, Kritsch-Armstrong, and the writer. Although the surface materials collected by the writer and used for our experiments were somewhat fractured (Plate 4), aboriginal peoples could have obtained better materials by quarrying the bedrock. Other raw materials were available to prehistoric peoples as along the edges of the chert are coarser andesite and dacite tuff and/or cherty bedded rhyodacite and rhyolite (Jensen 1972). Although the finer grained, more elastic and easily worked green chert was preferred by aboriginal peoples, use was also made of the less elastic, harder to work and coarser grained materials mentioned above. For experimental purposes a range of materials was collected during the writer's 1980 geological expedition into the area led by Larry Jensen. On a lithic materials scale from 5.5 to .5 (Callahan 1979:16) the fine grained laminated chert rates a 3.5 while the coarser rhyodacite, andesite and dacite peripheral materials rate only 4.5 to 5.0.

Plate 1: The welded (cherty) tuff formation outcrops in centre of photo. Outcrop exposed at base of Mt. Goldsmith near former logging road. (1980 photo).

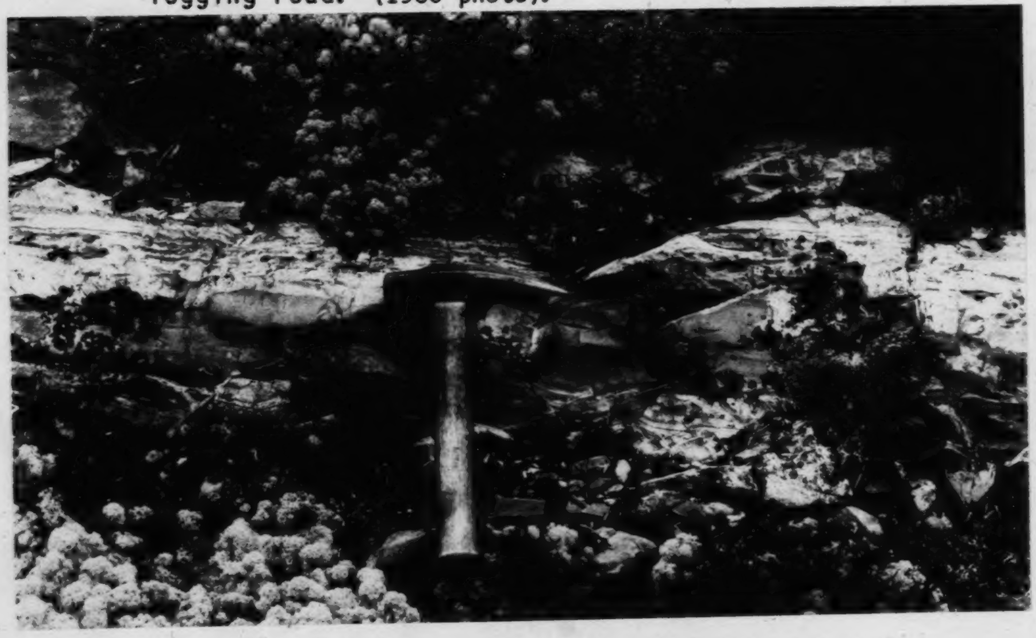


Plate 2: Close up of thinly laminated chert beds at centre of formation. A thinly bedded iron and jasper unit is also associated. Both chert and iron formation units average about 10 cm in thickness. (1980 photo).

Plate 3: View toward Lake Abitibi and the Jessup Site from the Mount Goldsmith Quarry Site. (1980 photo).

Plate 4: Highly fractured (but fine grained) lithic material available on surface at Mount Goldsmith Quarry Site. (1980 photo).

CHAPTER IV

PREHISTORIC SITE DESCRIPTIONS AND METRIC ANALYSIS OF THE ARCHAEOLOGICAL/PREHISTORIC ARTIFACTS

Part One: Jordan Site (DeHa-8)

Before proceeding further with the thesis, a preliminary description of the three prehistoric archaeological sites forming the archaeological basis of this thesis is in order.

The Jordan Site, a prehistoric campsite, first located in 1973 by Justin and Marjorie Jordan of Iroquois Falls, Ontario, was surface collected by them during the years 1973, 1974, and 1975 (Figure 6). As the site has been continuously inundated since 1975 it may have been destroyed by the continuing high water levels and storms. During a visit to the site by the writer in 1979 the site was completely under water (Plate 5). Extensive subsurface testing of all above water areas near the site failed to produce any cultural materials. The majority of the archaeological specimens, including the important large bifaces, came from a 2 m x 2 m feature area. The remaining materials were spread over a 70-metre length of low clay shoreline overlaid by a thin layer of water deposited sand. Materials were found among the larger boulders present on the shoreline, along with numerous fire broken rocks (Jordan, Jordan, and Crockatt 1976:17). All of the prehistoric artifacts under study from the Jordan site were collected by Mr. and Mrs. Jordan.

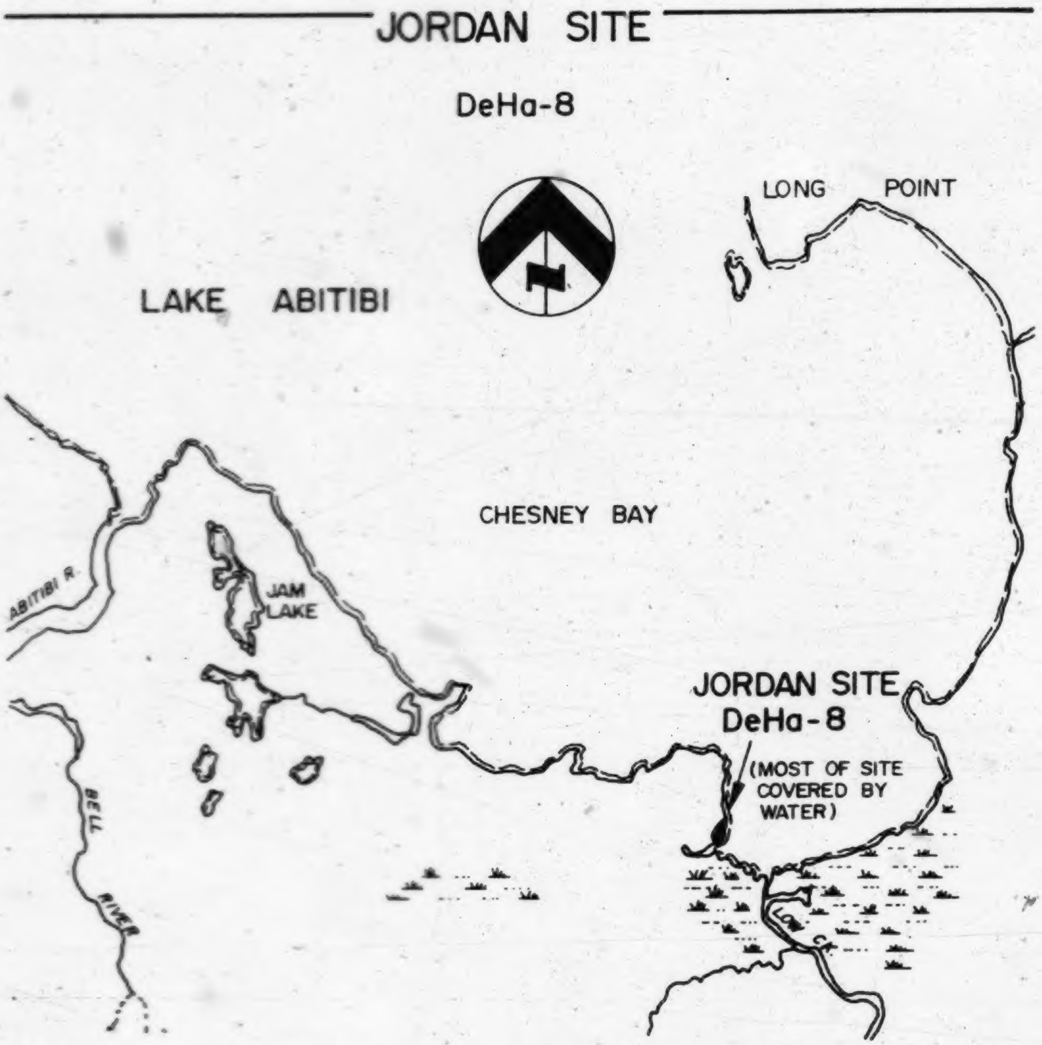

JORDAN SITE
DeHa-8
LONG POINT
LAKE ABITIBI
CHESNEY BAY
ABITIBI R.
JAM LAKE
BELL RIVER
JORDAN SITE
DeHa-8
(MOST OF SITE COVERED BY WATER)
LOW CR.

Figure 6: Map showing location of the Jordan Site (DeHa-8).

0 1 2 km

The artifacts from the Jordan site include very large bifaces, numerous other bifaces, extremely large crescentic end scrapers, trihedral adzes, unifaces, flake scrapers, and uniface blades made from large crescentic flakes (see Plates 6 and 7). This assemblage in some respects is comparable to the Caribou Lake complex found on the east side of Lake Winnipeg (Steinbring & Buchner 1980:25-29).

Dating the Jordan site materials remains a problem. A few small pieces of bone (10 grams) are available from the site, and these will be saved for radiocarbon-14 accelerator dating when it becomes available commercially in a few years. The problem of dating the site is also complicated by the possibility of minor mixture from some later components.

There are other similarities between the Jordan site and the Caribou Lake complex. The Jordan Site is situated, like the Caribou Lake complex, on the shore of a very large water body. The Jordan site is situated in an area of extremely low elevation on lacustrine clay and has been inundated by flooding. Even allowing for modern flooding levels due to the dam on the Abitibi River, the fact that the entire site is under water and is still partially covered even when water levels reach close to natural levels, indicates that the site was occupied during the prehistoric period of lowest water levels. This surmise is further supported by the fact that the sandy terrace not far to the rear of the site was never occupied, as this terrace was extensively subsurface tested during my 1979 fieldwork at the site. As outlined in Table 5, paleoenvironmental evidence shows that the warmest and most arid period was the time span between 5250 B.C. to 4000 B.C. (7,250 - 6,000 yrs. B.P.). The fact that the site is situated on lacustrine clay places a maximum date for the site at the time of the glacial lake draining 5900 B.C. (7,900 yrs. B.P.). The warmer and drier post glacial hyperbissal period lasted until 1250 B.C. (3,250 yrs. B.P.) but a possible break occurred during the 4000 B.C. to 1250 B.C. period (6,000 - 3,250 yrs. B.P.) when a trend towards more modern conditions may have become established. From this paleoenvironmental and settlement pattern evidence, the writer concludes that the Jordan site was occupied during the maximum of warm temperature and aridity in the Lake Abitibi region, a dating which would place it in the period immediately following glacial lake drainage from 5250 B.C. to 4000 B.C. (7,250 to 6,000 yrs. B.P.). This time frame corresponds well with the suggested time frame for the Caribou Lake complex dated by similar evidence to between 5500 and 4500 B.C. (7,500 to 6,500 yrs. B.P.) (Steinbring & Buchner 1980:33).

The primary purpose of the investigations during the 1979 fieldwork at the Jordan site (DeHa-8), was to investigate the potential subsurface artifact occurrences at the site. This work was not possible due to high water levels. In fact the site has been continuously under water since 1975 (M. Jordan: personal communication). However, all areas in the general vicinity of the site were extensively tested by single shovel hole testing (0.25 m square) with entirely negative results. Special attention was paid to the remnant esker behind the site some 30 to 60 metres back from the present shoreline. Although one might expect to find archaeological materials here, none were located despite forty 0.25 x 0.25 metre test pits placed at random along the rim of the sand topographic feature. As mentioned, this work strongly supports the premise that the site was occupied during times of extremely low water levels. The fieldwork phase of the project extended from July 10th to July 27th, although before and after that time considerable effort was expended on examining the existing collections from the Jordan site (owned by Justin and Marjorie Jordan) and preparing the material for shipment to the University of Alberta, Edmonton, where it was subsequently analyzed.

Unfortunately, the Jordan site (DeHa-8) also remained under water throughout subsequent fieldwork undertaken by the writer during 1980, 1981, and 1982. Therefore, important subsurface testing or attempts to obtain radiocarbon datable materials or additional specimens have not been possible to date. Hopefully, in the future an unusually dry year will result in extremely low water levels that may expose the site for further research and allow the collection of radiocarbon datable materials.

Lending further support for an early occupation of Lake Abitibi is a radiocarbon date obtained from a component 250 km (155 miles) south of the Abitibi area at the north end of Fox Lake, part of the Spanish River system draining into Lake Huron. The Fox Lake date of 7,670 +/- 120 B.P. refers to a biface complex. The date of 5720 B.C. is the earliest yet obtained on archaeological materials in northeastern Ontario (Chris Hanks: personal communication, January 1981). Evidently, the people who made the large bifaces occupied new land exposed by the draining of glacial Lake Barlow circa 5900 B.C. (Vincent & Hardy 1979:17).

It would be extremely unusual if the Lake Abitibi area, rich in faunal and flora resources, remained unoccupied following deglaciation and drainage of the post glacial lake for some two thousand years or more until the arrival of Shield Archaic and possibly some Laurentian Archaic Vergennes Phase peoples in the area (Noble 1980:27, Knight 1977, Pollock 1976:167) circa 3000 B.C.

In conclusion, the total available evidence suggests that the Jordan site represents the earliest post glacial occupation in the Lake Abitibi area and that this complex dates to the time period between 5250 B.C. and 4000 B.C. (7,250 - 6,000 yrs. B.P.) prior to subsequent inhabitation of the area by subsequent Archaic peoples.

Prior to the cognitive based experimental technological analysis of the Jordan collection, a standard description of each biface from the site (Plate 7) including basic metric measurements, was undertaken. The results of this preliminary analysis are presented in Table 32 (in appendices).

Plate 5: The Jordan Site (DeHa-8) covered by water.
Photo by John Pollock, 1979.

0 1 2 3 4 5 6 7 8 9 10 cm

Plate 6: Total sample of large bifaces from the Jordan collection (DeHa-8). From these four, two were selected for analysis.

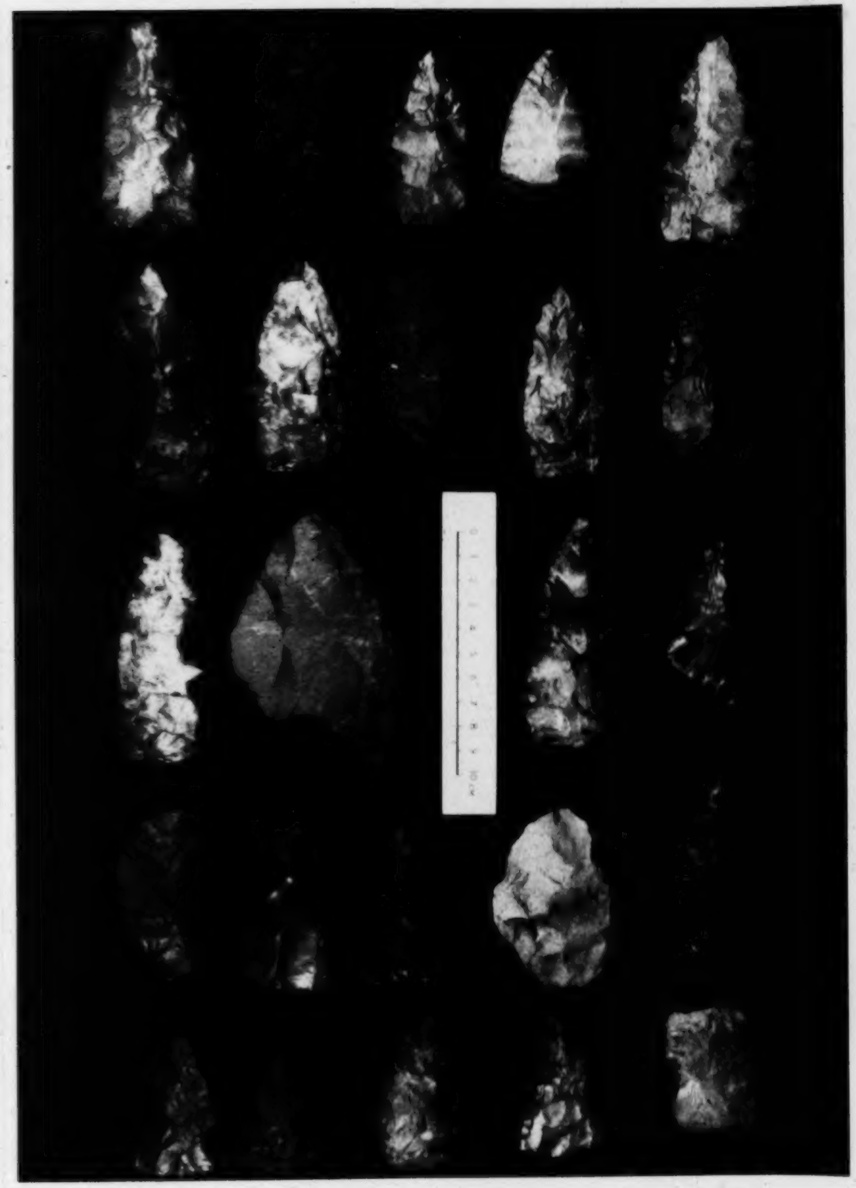


Plate 7: Total sample of medium sized bifaces from the Jordan collection (DeHa-8). From these, four were selected for detailed analysis in this thesis.

Part Two: Jessup Site (DdGw-2)

The Jessup Site (DdGw-2), a major lithic reduction and workshop site (Figure 7, Plates 8 to 12), was recorded by Marjorie and Justin Jordan (1976) who also recorded and collected materials from the site in 1977. The 1977 investigations revealed the site to be a major one for the entire Canadian Boreal Forest. The site is at least 2.5 km in length, spread out along a shoreline which varies from a low clay beach with a thin sand covering, to rocky outcrops separated by steep varved clay banks with narrow sandy beaches. A great many archaeological materials have been exposed by at least 30 metres of wave cut erosion. The beaches are covered with artifacts, mainly cores, flakes, and biface preforms or rough outs (Jordan & Jordan 1977). Only during one year of extremely low water levels (about 874.25 feet) during 1977 has the entire site been exposed. Hearths and cores were exposed along with uncountable numbers of flakes, cores and finished artifacts (Jordan & Jordan 1977). At that time the Jordans also documented evidence of extensive looting by private collectors (Jordan & Jordan 1977: no pagination). Subsequently, in the fall of 1977, Ministry of Natural Resources officers confiscated an illegal collection of artifacts from a private collector. These 20 artifacts have been analyzed and described by Thor Conway (who did not visit the site), a Regional Archaeologist with the Archaeology and Heritage Planning Branch, Ontario Ministry of Citizenship and Culture (Conway 1978).

The writer first visited the site during 1979, at which time Ingrid Kritsch-Armstrong, as part of her M.A. studies at McMaster University, conducted some excavations at the only high terrace locality

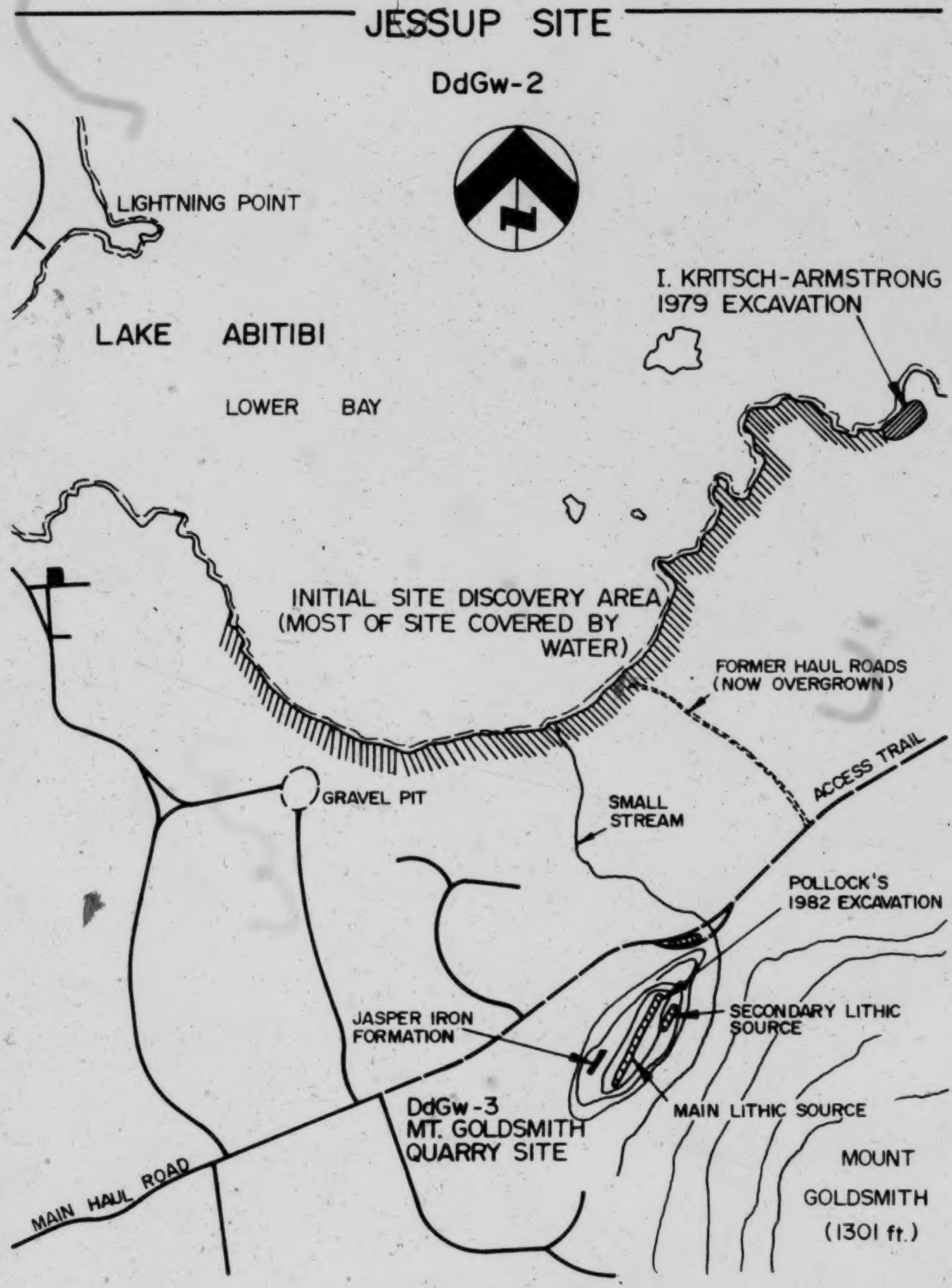

JESSUP SITE
DdGw-2
LIGHTNING POINT
LAKE ABITIBI
LOWER BAY
I. KRITSCH-ARMSTRONG
1979 EXCAVATION
INITIAL SITE DISCOVERY AREA
(MOST OF SITE COVERED BY
WATER)
FORMER HAUL ROADS
(NOW OVERGROWN)
ACCESS TRAIL
GRAVEL PIT
SMALL
STREAM
POLLOCK'S
1982 EXCAVATION
SECONDARY LITHIC
SOURCE
JASPER IRON
FORMATION
MAIN LITHIC SOURCE
DdGw-3
MT. GOLDSMITH
QUARRY SITE
MOUNT
GOLDSMITH
(1301 ft.)
MAIN HAUL ROAD
0 500 1000m

Figure 7. Map showing the Jessup and Mt. Goldsmith sites including the location of the 1982 archaeological work.

on the site (Kritsch-Armstrong 1980, 1982) (Plate 10). Her excavations of 29 square metres produced over 100,000 flakes in a 6 - 8 cm layer, amply demonstrating the quarry-workshop nature of the site. However, the actual bedrock quarry site as opposed to the Jessup workshop site(s), although suspected by Kritsch-Armstrong and myself to be nearby, was not located until the following year. During 1980, the writer, accompanied by Larry Jensen, a geologist with the Ontario Division of Mines (who has worked in the area since 1972), did locate the geological formation supplying the lithic raw material, and at least one of several possible bedrock quarry locations on nearby Mt. Goldsmith. The site was not visited again until late September of 1982, when unfortunately water levels were high and the site was entirely under water except for a narrow strip of sand (Plates 11 and 12) from which only a few flakes and cores were eroding.

Kritsch-Armstrong's excavation showed that the higher terrace contained a multi-component archaic and middle woodland occupation with no physical stratigraphic separation at depths averaging from 5 to 10 cm overlying a clay subsoil. Her excavations recorded five features comprising two pits and three hearths. Faunal identifications were sparse with only beaver (Castor canadensis) being positively identified along with the possibility of deer/caribou. A single attempted radiocarbon date from calcined bone did not contain enough collagen for a C-14 date (Kritsch-Armstrong 1982:50-67).

In contrast to Kritsch-Armstrong's excavated materials, the prehistoric specimens analyzed in this thesis were collected from the underwater areas of the site not accessible to Kritsch-Armstrong in 1979. The Jordans have kindly loaned the writer their extensive surface collections from the Jessup site obtained during 1976 and 1977 (Plate 13). Photographs taken by the Jordans of the site and their descriptions (1977) show that the underwater portion of the site contained hearth features and represents a true living floor occupation and not erosion deposited artifacts. Because of the lower elevation it is also possible that the underwater portion of the site contains less component mixture of later middle woodland materials. The writer agrees with Kritsch-Armstrong's conclusion that Jessup is a multi-component site inhabited by both Shield Archaic and Middle Woodland Laurel peoples; and was utilized as a lithic workshop and habitation site (due to the nearby raw material source(s) at the Mount Goldsmith Quarry) over a period of approximately 3,000 years (Kritsch-Armstrong 1982:258).

In contrast to the Jordan site materials which I estimate to date between 5250 - 4000 B.C. (7,250 - 6,000 yrs. B.P.), the Jessup site archaic materials [related to the Abitibi Narrow Phase of the Shield Archaic Tradition as defined by the writer (Pollock 1975:10, 1976:175)] are estimated to date between 3000 - 1000 B.C. (5,000 - 3,000 yrs. B.P.). These sites may or may not evolve into the succeeding Mattawan Archaic (Pollock 1976:177) and Laurel phases. Indeed, Kritsch-Armstrong's artifact analysis based on metric data and a good judgmental descriptive analysis of manufacturing techniques and technological processes found at the site, together with an analysis of the flakes recovered, showed more statistical similarities than differences between the Archaic and Laurel components, although she cautions that this may be partly a function of the same raw material being utilized. In her technological analysis Kritsch-Armstrong (1982:222) points out that the hardness of the welded volcanic tuffs at Jessup was a problem faced by the prehistoric knappers. Other features of the raw material such as bedding planes and changes from coarse to fine texture caused breakage and thinning problems. These problems were also evident in the experimental work for this thesis when two specimens broke during our experiments due to similar reasons.

As was the case with the Jordan site biface collection, bifaces from the Jessup site (Plate 13) were described and basic metric measurements undertaken prior to the cognitive analysis. The results of this preliminary analysis are given in Table 33 (in appendices).

Plate 8: Aerial photograph of the main Jessup Site area under water during 1979.

Plate 9: Some of the artifacts collected for the thesis came from areas in the vicinity of the float plane (1979 photo).

Plate 10: A small portion at the eastern end of the Jessup Site (DdGw-2) near the locale excavated by Ingrid Kritsch-Armstrong in 1979. Photo by John Pollock, 1979.

Plate 11: Main area of the Jessup Site (DdGw-2), which is underwater, looking east. Photo taken in 1982. Many of the bifacial specimens in the dissertation were obtained from this area during a period of low water levels in 1977.

Plate 12: The Jessup Site (DdGw-2), looking west towards Lightning Point. Photo taken in 1982.

0 1 2 3 4 5 6 7 8 9 10 cm

Plate 13: Total sample of medium sized bifaces from the Jessup Site (DdGw-2).

Part Three: The Mount Goldsmith Quarry Site (DdGw-3)

As previously mentioned, the location of the suspected quarry for Lake Abitibi had long been speculated upon by early researchers (Ridley, Lee, Jordans, Kritsch-Armstrong) and virtually all other researchers who have worked on the lake. However, it was not until August 1980, that I was fortunate to meet Dr. Larry Jensen, who recognized an archaeological core I showed to him from the Jessup site as being of the same laminated chert material as a nearby cherty tuff formation. The results of the 1980 preliminary geological and raw material sample collecting investigations have been outlined in Chapter III of this thesis along with a detailed geological description of the site, and the reader is referred to that chapter for the relevant geological background data to the 1981 and 1982 archaeological work at the quarry site.

Any incipient doubts regarding the connection of the Mount Goldsmith Quarry to the Jessup site workshop (Figure 7) have been answered by Ingrid Kritsch-Armstrong's chemical and trace element analysis of eight archaeological specimens from the Jessup site. The results of the analyses which indicated a 60 to 72.2% silica content (along with ten chemical and eight trace elements), indicated the archaeological specimens were of "calc-alkalic dacite tuff, which extends into calc-alkalic andesite tuff on the mafic side and calc-alkalic rhyolite tuff on the felsic side" (Kritsch-Armstrong 1982:72). From the results of the chemical and trace element analysis, Larry Jensen considers the Jessup Site prehistoric archaeological specimens to be "identical" in rock type to the nearby Mount Goldsmith quarry cherty tuffs.

The 1981 Investigations

Access to the site (Figure 7) is very difficult, as the former Abitibi haul road is now overgrown and several huge washouts of the roadway caused by beaver dams make road access impossible. By air, access is equally difficult, as the shallow waters of Lower Bay and numerous rocks make landing by float plane difficult. It is also one kilometre by trail to the quarry area from the lake (see Figure 7). During 1981, utilizing an Argo and a small ATV trike to gain access, we were able to cut a trail to the site and mark the major outcrop areas of the quarry with flagging tape. The work confirmed that the site was prehistoric, and the presence of large piles of detritus showed that it was indeed a prehistoric quarry. Bad weather limited the 1981 work, and unfortunately we were not able to test any of the large "pit" depressions. Larry Jensen and his crew as well as the Jordans, Ingrid Kritsch-Armstrong, and Dennis Armstrong assisted with the 1981 work.

The 1982 Investigations

A. Excavations at the Depressions or Pits

During September of 1982, the writer with a crew of three persons returned again to the site. This time due to drier weather the access trail was in better shape and we were able to use two ATV trikes to gain access, although each return trip into the site took about three hours of travel from our base at Perry Lake.

Upon arriving at the site, we eventually selected one of the possible quarry pits (see Figures 8 and 9) for excavation which was located at the north end of the quarry site. The quarry site itself is located on a smaller topographic high just west of the main Mount Goldsmith peak (see Figure 10, Plate 14), the first topographic high from the lake, with an excellent view (Plate 15).

After selecting a depression for excavation the difficult task of removing trees, shrubs and rock from the depression began (Plates 16 and 17). Figure 9 outlines a portion of the excavation area, which was circa eight metres long by four metres wide. The excavation was situated on the side of the hill, and contained a buried exposure of chert vein material about 30 cm wide situated in the centre of the depression (see Plate 17).

As the excavation proceeded, a problem was encountered in the form of ground water which flooded the excavation to a depth of 20 cm (Plate 17) making further progress impossible. As we did not have a water pump, work was severely hampered by these conditons. Two cores (Plate 25) and some flakes were recovered from the excavation of the pit, but there was not a great deal of detritus or debitage present.

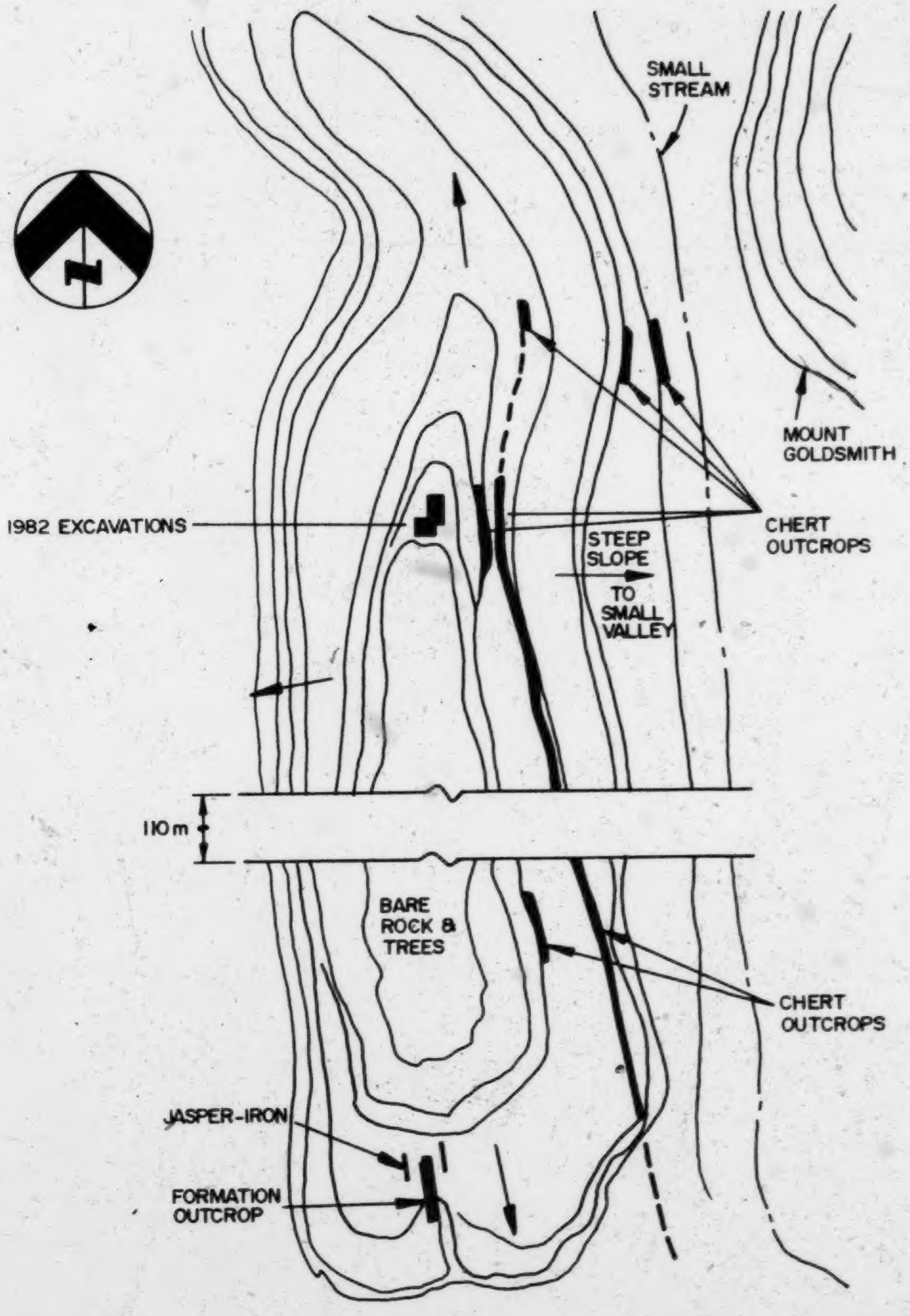
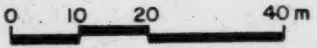

SMALL STREAM
MOUNT GOLDSMITH
1982 EXCAVATIONS
CHERT OUTCROPS
STEEP SLOPE TO SMALL VALLEY
110m
BARE ROCK & TREES
CHERT OUTCROPS
JASPER-IRON
FORMATION OUTCROP

Figure 8: Sketch Map of the Mount Goldsmith Quarry Site DdGw-3.



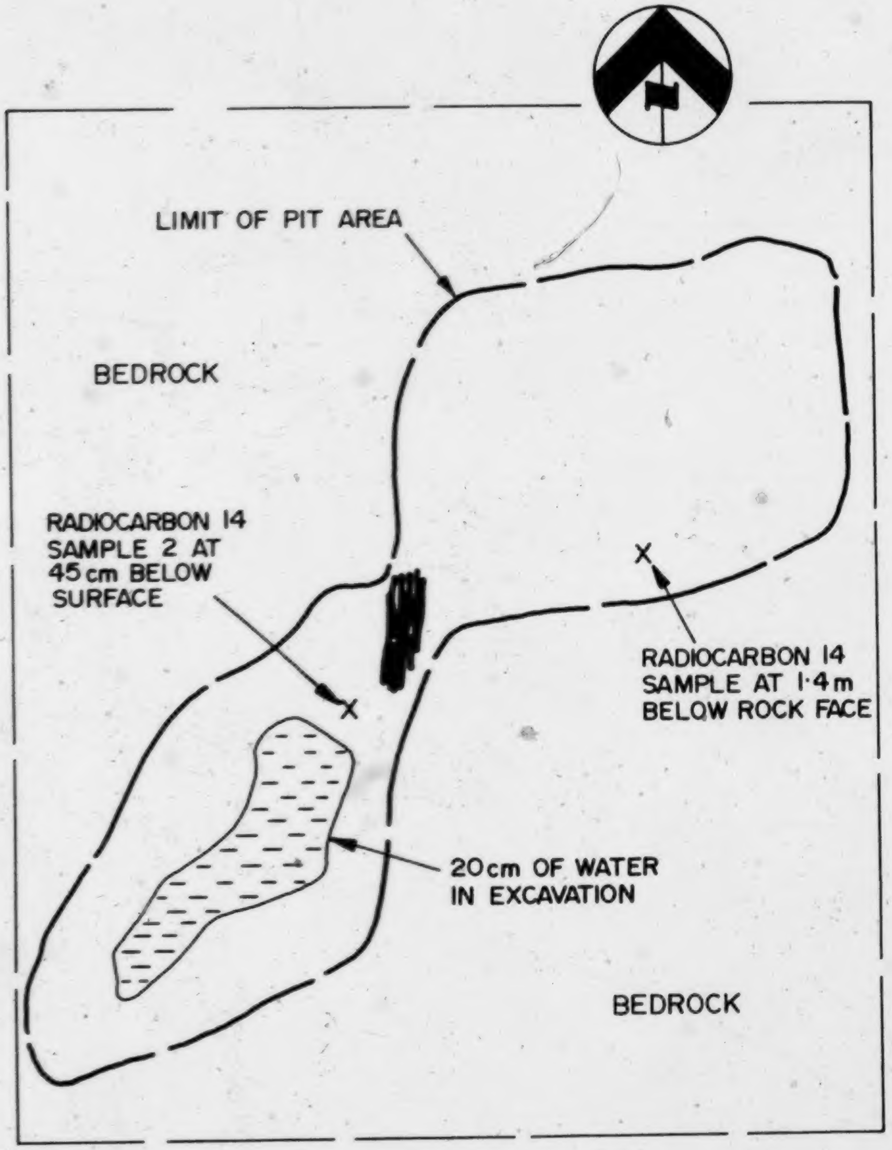

LIMIT OF PIT AREA
BEDROCK
RADIOCARBON 14
SAMPLE 2 AT
45 cm BELOW
SURFACE
RADIOCARBON 14
SAMPLE AT 1·4 m
BELOW ROCK FACE
20 cm OF WATER
IN EXCAVATION
BEDROCK

Figure 9: Map of 1982 excavation at the Mount Goldsmith Quarry Site (DdGw-3). The excavation centered on a noticeable depression in the chert deposit.

Discussion

The writer's initial thoughts following the 1982 investigation of the numerous depressions in the chert deposit area was that they were natural and may have been simply used by prehistoric peoples as disposal areas and/or for access to portions of the chert deposit (Settlement Surveys Ltd. 1983:211). No positive evidence of quarrying of rock was evident although such is very difficult to determine archaeologically. The fact that the pits are relatively free of chert flakes, etc., may be due to removal of cores and chert material, or may simply reflect the fact that they are natural features. A very positive factor for an aboriginal origin is that the pit excavated was located on the chert vein. More pits need to be excavated. If all pits are found to be centered in chert veins a pattern would be established that would argue strongly for a man made origin. In the case of the excavated pit this factor is quite significant, as the chert is only exposed in the pit depression, and no chert is visible on the bedrock surface on either side of the pit up or down strike along the deposit. If this pattern extended to all other pits a definite argument for a man made origin could be supported.

Also there is some indication from the 1982 investigation that the lithic material exposed in the pits may be a little coarse grained but at the same time more massive than the finer grained exposed chert, which has a lot of internal flaws and fracture planes. Thus, there would have been an incentive for prehistoric peoples (especially early peoples) to obtain the more massive material in order to produce large bifaces.

B. Prehistoric Chert Collecting Areas Along Strike of the Chert Deposit

In contrast to the inconclusive evidence regarding the nature of the depression features, there was ample evidence of surface mining and surface collecting of raw material along the strike of the chert outcrop which closely resembles a vein of material (i.e., like a quartz vein) (see Plate 18). The chert strikes north, 50° west; and appears to dip vertically or near 90° to the surface. As the chert has its origin as a band of ash deposited between succeeding lava flows (i.e., the banding is visible in the deposit) this feature indicates folding and deformation of the material since deposition. This has compressed and silicified the original volcanic ash into chert.

Figure 8 shows the entire exposed length of the chert outcrop at DdGw-3 and indicates the major prehistoric raw material collecting areas recognized during the 1982 fieldwork. The total length of exposed chert material is some 200 metres long and varies in width, as mentioned, from 20 cm to 170 cm at the widest point (Figure 10).

Nearby the southwest end of the deposit, there is an exposure of Jasper-iron formation (see Figure 8) which may also have been collected by aboriginal peoples. As well, there are numerous side or parallel veins of chert material some of which are more massive with less internal flaws or fractures and therefore more suitable for tool manufacture than some of the exposed materials. These are located both upslope of the main exposed vein and also downslope and in the valley to the northeast containing a small stream. A heavy overburden of humus, shrubs, trees and rock falls make the task of locating and assessing these other areas very difficult. The possibility is very good that

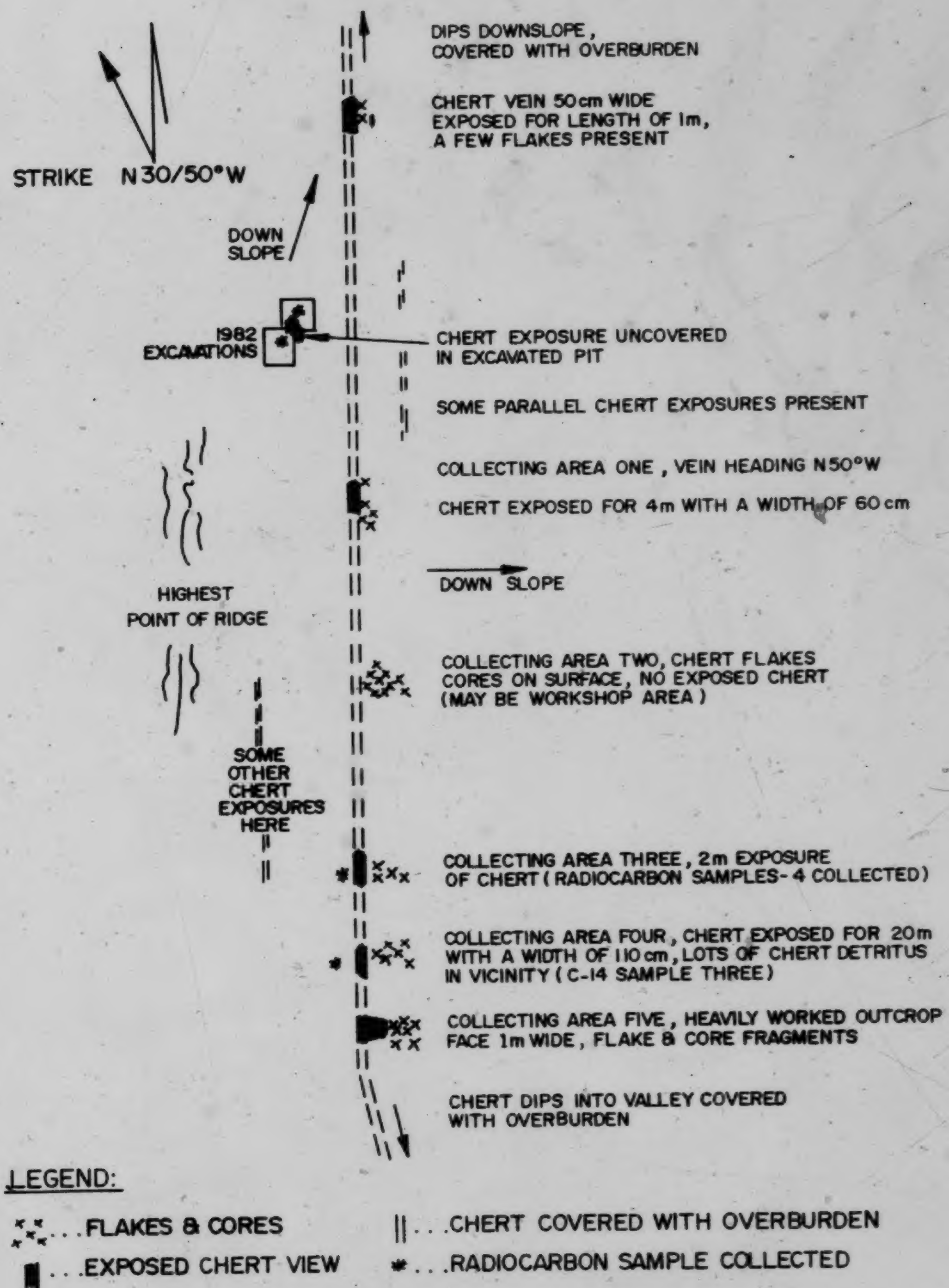

DIPS DOWNSLOPE,
COVERED WITH OVERBURDEN
CHERT VEIN 50cm WIDE
EXPOSED FOR LENGTH OF 1m,
A FEW FLAKES PRESENT
STRIKE N30/50°W
DOWN
SLOPE
1982
EXCAVATIONS
CHERT EXPOSURE UNCOVERED
IN EXCAVATED PIT
SOME PARALLEL CHERT EXPOSURES PRESENT
COLLECTING AREA ONE, VEIN HEADING N50°W
CHERT EXPOSED FOR 4m WITH A WIDTH OF 60cm
DOWN SLOPE
HIGHEST
POINT OF RIDGE
COLLECTING AREA TWO, CHERT FLAKES
CORES ON SURFACE, NO EXPOSED CHERT
(MAY BE WORKSHOP AREA)
SOME
OTHER
CHERT
EXPOSURES
HERE
COLLECTING AREA THREE, 2m EXPOSURE
OF CHERT (RADIOCARBON SAMPLES- 4 COLLECTED)
COLLECTING AREA FOUR, CHERT EXPOSED FOR 20m
WITH A WIDTH OF 110cm, LOTS OF CHERT DETRITUS
IN VICINITY (C-14 SAMPLE THREE)
COLLECTING AREA FIVE, HEAVILY WORKED OUTCROP
FACE 1m WIDE, FLAKE & CORE FRAGMENTS
CHERT DIPS INTO VALLEY COVERED
WITH OVERBURDEN
LEGEND:
×... FLAKES & CORES
▮... EXPOSED CHERT VIEW
||... CHERT COVERED WITH OVERBURDEN
*... RADIOCARBON SAMPLE COLLECTED
0 10 20 40m

Figure 10: Major prehistoric chert collecting areas, Mt. Goldsmith Quarry Site (DdGw-3).

there are other perhaps more important collecting areas along the strike of the formation that have not yet been located.

Returning to the main exposed chert band shown in Figure 13, the first collecting area (proceeding from north to south) is located just past the 1982 pit excavations (Plate 19, also Figure 10). This exposed area, some 60 cm wide by four metres long, exhibits battering of the chert deposit and numerous piles of detritus from reduction activities including many platform flakes, etc., which could not be the result of natural weathering.

The second collecting area (Figure 10, Plate 20) has no surface exposure of chert and consists of flakes and cores on surface. This may be a workshop area for primary reduction.

Collecting area three (Figure 10, Plate 21) is an exposure of chert 170 cm wide, and contains a great deal of detritus. Here a humus layer 10 cm thick of roots, etc., covered the chert vein. Interbedded in the humus were numerous flakes and other debitage from prehistoric collecting activities. After stripping back the humus a sample for radio carbon 14 dating was obtained from the deepest area of soil cover and one with a mass of flakes. The sample was obtained from the humus/bedrock interface area and should give a minimum date for use of the quarry site.

Area four (Figure 10, Plate 22) is an extensive flat sloping area of outcrop (Figure A17) some 20 metres long by 110 cm wide. Surrounding the exposure are large quantities of detritus.

Area five (Figure 10, Plate 24) is one of the major places along the 200 metre chert outcrop where there is solid evidence of prehistoric peoples not only surface collecting but actually mining or removing "in situ" raw material from the rock face. At the base of the exposure there are piles of flakes (Plate 23). The vertical worked face (Plate 24) shows the scarring effect of prehistoric mining and removal of large quantities of chert.

Artifact Collections

No finished artifacts have been collected from the quarry site area and there does not appear to be a prehistoric campsite at the quarry itself. There are quantities of large and small flakes, core fragments and core shatter material as well as naturally broken material. Two cores were recovered from the excavation of one of the depression areas on the chert deposit. The two cores (Plate 25) and a representative sample of larger flakes and core fragments are illustrated (Plates 26 and 27). Many of the flakes show distinct striking platforms and percussion bulbs indicating they are the product of aboriginal mining as opposed to frost cracking and other natural causes, although, no doubt, a percentage of the talus on the site may be a result of natural causes.

Comparison of the Mt. Goldsmith Quarry with other prehistoric quarries in North America demonstrates that it conforms to the general pattern of quarry sites. Details follow in the next section of the thesis.

Plate 14: The main Mt. Goldsmith peak is located just east of the quarry site (1982 photo, looking east from quarry).

Plate 15: View of the Jessup Site (DdGw-2) and Lake Abitibi (Lower Bay and Lightning Point). 1982 photo, looking north from Mt. Goldsmith Quarry Site (DdGw-3).

Plate 16: Clearing roots, trees and rock from depression in an area where a large core was recovered (Plate 25:top item).

Plate 17: Main 1982 excavation area; note chert vein exposed in center of photograph (under tape measure) and groundwater in excavation.

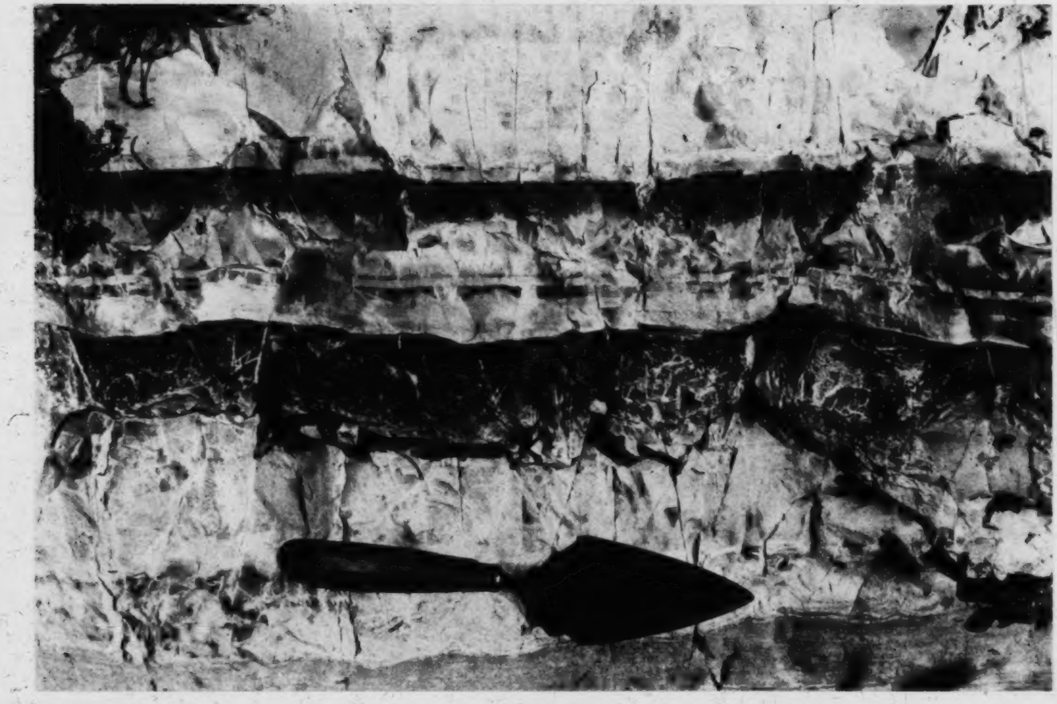


Plate 18: The welded tuff or chert vein varies from 20 cm to 170 cm in width and consists of banded beds of green chert with considerable variation in grain size and colour.

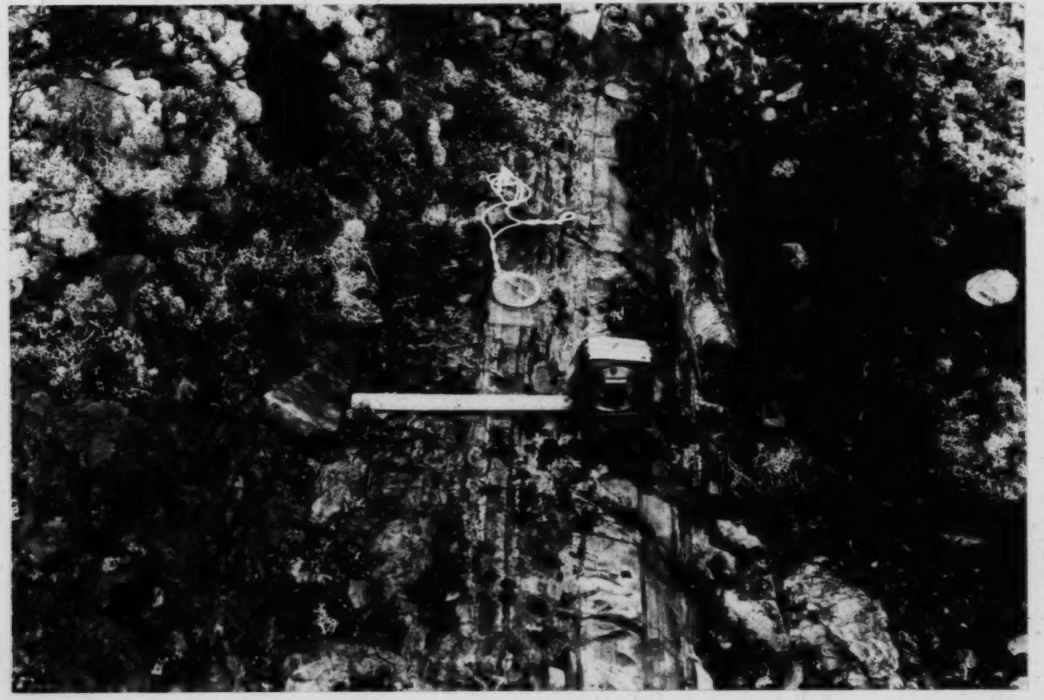


Plate 19: Collecting Area One, Figure 10 (60 cm wide by 4 m long).

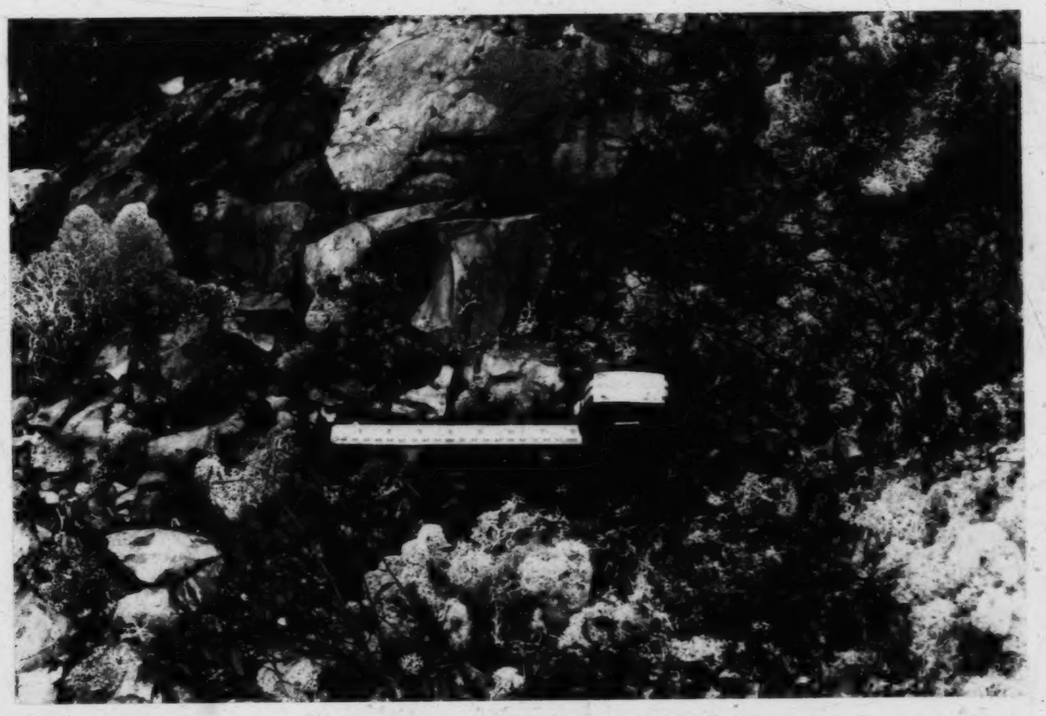


Plate 20: Collecting Area Two (Figure 10), flakes and cores on surface with no nearby exposure of chert.

Plate 21: Collecting Area Three (Figure 10). The chert here is 170 cm wide, with many flakes & cores nearby.

Plate 22: Collecting Area Four (Figure 10), numerous flakes and cores left on surface.

Plate 23: Piles of flakes are present at the base of collecting Area Five (Figure 10).

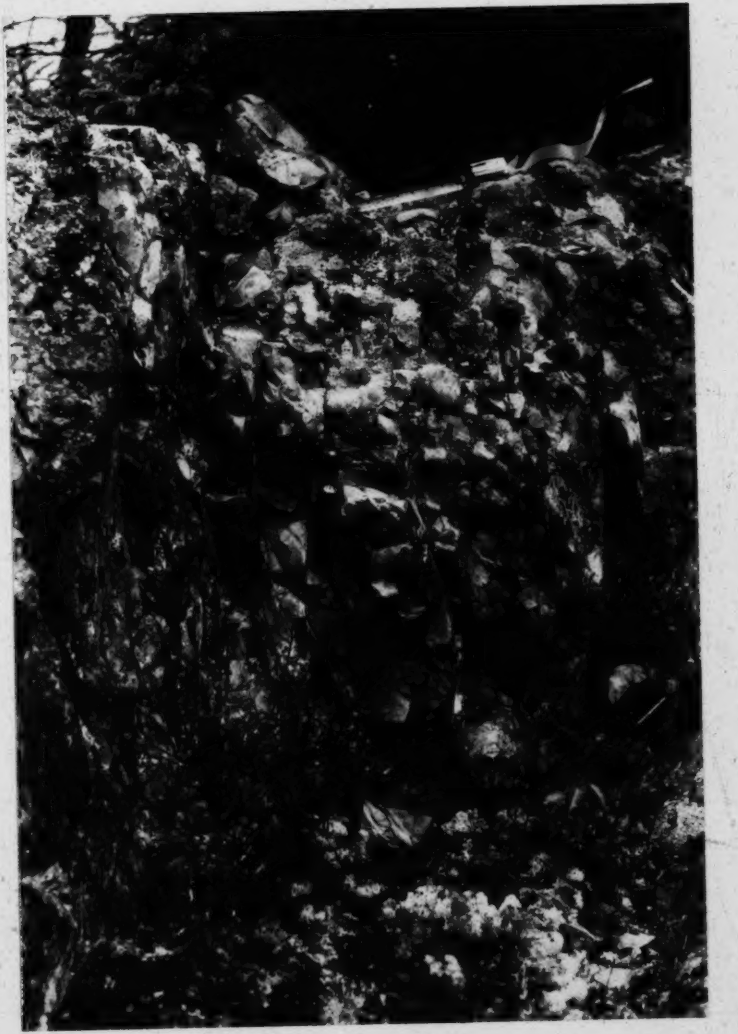


Plate 24: Collecting Area Five (Figure 10). This vertical face shows the scarring effect resulting from removal of a large quantity of material by prehistoric flintknappers.

Plate 25: Aboriginal cores recovered from excavated area (Figures 8 & 9) at the Mt. Goldsmith Quarry Site (DdGw-3).

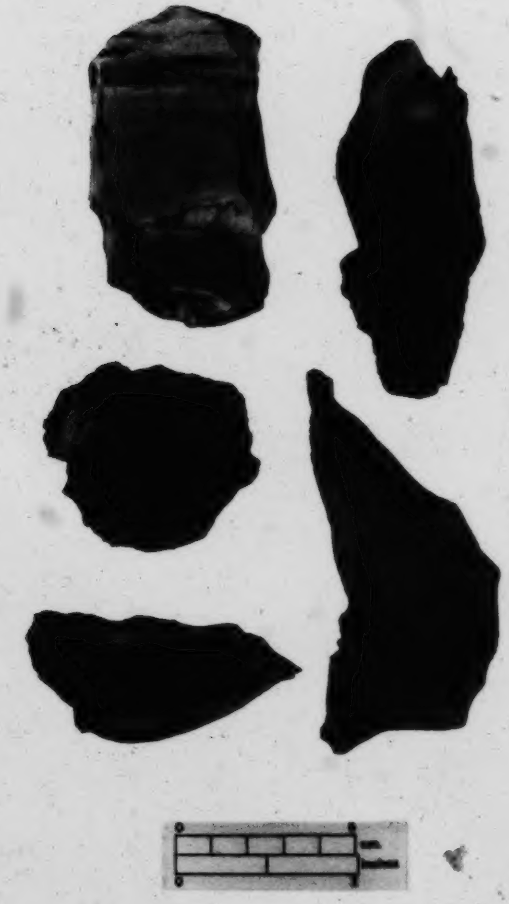


Plate 26: Flakes and core fragments, Mt. Goldsmith Quarry Site (DdGw-3). Collected from all areas of the site during 1981 preliminary investigations.

Plate 27: Core fragments and flakes, Mt. Goldsmith Quarry Site (DdGw-3). All were collected from area three of site (Figure 10, Plate 21). These pieces exhibit flake scars, platforms, percussion rings and platform crushing, etc., not found on naturally broken rock.

Part Four: Comparison of Thesis Site to Other Archaeological Sites

Introduction

This comparative data section is included in the thesis for two reasons. First, as this thesis is the first application of the cognitive approach, there are simply no comparative cognitive technological data with which to place the thesis sites in a regional context. Secondly, it is hoped that this summary of data, based on more traditional chronicling or normative approaches, can be contrasted to the results obtained in this thesis. The knowledge obtained from the cognitive approach in this initial study indicates the tremendous potential of the method. Once further sites are analyzed, it will be possible to outline regional phases and perhaps shed new light on existing chronological sequences and cultures discussed in the following part.

Jordan Site

During our preliminary analysis of the Jordan Site a number of extremely large and well formed bifaces were noted, as well as some bifaces or projectile point preforms with notable basal thinning. Upon examining these materials, Robson Bonnichsen suggested these may be similar in manufacturing technique to the Anzick materials, a Clovis site in Montana (Figure 11) (R. Bonnichsen: personal communication). Unfortunately, only the bone tools from among the over 100 artifacts recovered from the Anzick site, a small collapsed rock shelter near Wilsal, Montana, have been described (Lahren & Bonnichsen 1974:148).

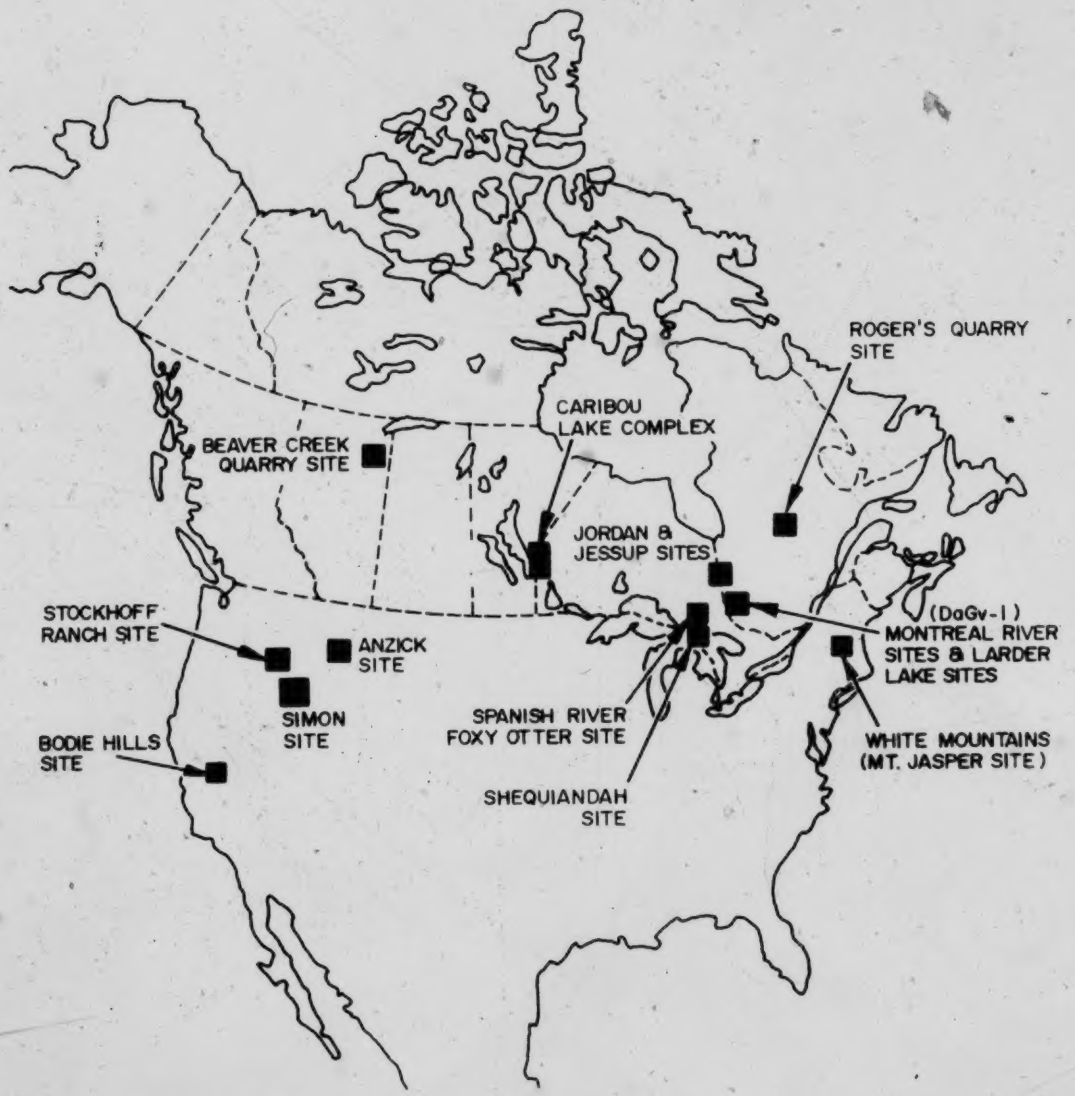

ROGER'S QUARRY SITE
CARIBOU LAKE COMPLEX
BEAVER CREEK QUARRY SITE
JORDAN & JESSUP SITES
(DaGv-1)
MONTREAL RIVER SITES & LARDER LAKE SITES
STOCKHOFF RANCH SITE
ANZICK SITE
SIMON SITE
BODIE HILLS SITE
SPANISH RIVER FOXY OTTER SITE
SHEQUIANDAH SITE
WHITE MOUNTAINS (MT. JASPER SITE)

Figure 11: Map of comparative archaeological sites discussed in text.

Bonnichsen also suggested, along with Alan Bryan, that a similar technology also occurred (in the form of very large bifaces) at the Simons Site, a Clovis occurrence at Big Camas Prairie near Fairfield, Idaho (Butler 1969:62).

During a visit to Maine in the fall of 1980, I was able to examine casts of bifaces from the Anzick and Simons sites. While they are in some visual respects similar to the Jordan site specimens, they are larger with large flake scars. In order to produce large bifaces, a method of removing large, spatulate, well controlled flakes across the body of the biface is required. As the technological options for producing such flakes appear to be limited, this may have produced a resemblance between the Lake Abitibi and Anzick-Simons bifaces. Other than the mentioned similarities, there is no other archaeological, environmental or other evidence that the Lake Abitibi Jordan site materials are related to the Clovis culture, and indeed, the location of the Jordan site on post glacial clay deposits suggests that the maximum date for these materials (i.e., 5900 B.C., see Table 7) is far younger than known Clovis sites.

Other sites, such as the Giant site on Manitoulin Island, (Figure 11) Ontario, have produced large bifaces up to 20 cm long and 12 cm wide (Lee 1954:66). These are comparable in size to the two largest Jordan site specimens which are 25 and 29 cm long and 11.5 and 9.5 cm wide respectively. Lee describes the blades as broad, leaf shaped objects. The major difference here is that Lee describes them as being thick and crude while the Jordan specimens are thin and very well made.

Other reported sites that may be comparable to the Jordan and/or Jessup site is the Paleo-Indian Lakehead complex estimated by Fox to date circa 10,000 years B.P. (Fox 1976:29). Although no large bifaces are present in the Lakehead complex collections, the presence of a "diagnostic" trihedral adze (Fox 1977 and McLeod 1978, 1981) in the Jordan collection may link this site to the Lakehead complex.

During 1981, as part of the thesis research, collections at the Ontario Government's Regional Archaeologists offices at Sault Ste. Marie (Mr. Thor Conway) and at Kenora, Ontario (Mr. Paddy Reid) were visited in an attempt to ascertain if any large bifaces or collections similar to the Jordan site materials had been reported. At Sault Ste. Marie only late archaic components are present and collections bear no resemblance to the Jordan or Jessup site materials. There are two exceptions. First is the John Sago site (CcHl-2) dated at 5,910 +/- 120 yrs. B.P. (3960 B.C.) (Chris Hanks: personal communication). It is Hank's interpretation that large bifaces similar in size to the Jordan and George Lake specimens (i.e., 20 cm x 12 cm) were being thinned at the site (although none were recovered) based on the fact that some lipped bifacial thinning flakes had dorsal surfaces 6 cm long. Hank's edge angle extrapolation places the tools in a thickness range of 2 - 4 cm (letter from Chris Hanks to John Pollock, April 7, 1981).

The other important site also recorded by Chris Hanks is the Foxy Otter Site (Figure 11) located on the north end of Fox Lake, part of the Spanish Rivers system draining into Lake Huron. This site is 250 km (155 miles) south of Lake Abitibi. I have examined the bifaces from this site and in terms of general size and shape they resemble some aspects of the biface collection from the Jordan-Jessup sites although there appear to be some technological differences. The site has been dated at 7,670 +/- 120 years B.P. or 5720 B.C. and is the earliest date yet recorded for Late Plano/Early Archaic sites in northeastern Ontario.

At Kenora, only one Shield Archaic site has been reported for northwestern Ontario, despite years of continuous field survey in the area. This site is DiKm-20, located on an island in Whitefish Bay on Lake of the Woods. In the collection are a number of large flat spatulate biface thinning flakes up to 5 cm wide and 6.5 cm long as well as the tip of several bifaces in the size and shape range of the Jessup and/or Jordan collections (Paddy Reid: personal communication). Further west in Manitoba, research by the University of Manitoba (Wheeler 1978, Buchner 1979) has reported fifty-two sites designated as the Caribou Lake Complex (Figure 11) located on the eastern side of Lake Winnipeg (Steinbring and Buchner 1980). Projectile points from the complex are mainly "crude representations of Plano forms . . . essentially percussion-worked, but are well defined as to outline" (Steinbring & Buchner 1980:25). The complex contains a large range of biface variation as well as extremely large bifaces. Trihedral adzes, large percussion flaked end scrapers, and long curved prismatic flakes, all point to a relationship between the Caribou Island complex and the Jordan site materials. Settlement patterns, as well, are similar with the Caribou Lake complex sites being found mainly on large bodies of water all within the Boreal Forest, and at areas of low elevation on lakes. In the Winnipeg area, artifacts are found in lacustrine clay, suggesting a maximum date of 7000 B.C. for the component (Steinbring & Buchner 1980:25-33). It is interesting to note that the main area of most Caribou Island sites is below modern water levels. Steinbring and Buchner, therefore, suggest that occupation of Caribou Island sites occurred when water levels were depressed from modern levels. In the

Lake Winnipeg area the warmest and driest period was between 5500 and 4500 B.C. (Steinbring & Buchner 1980:33). In the Lake Abitibi area, the Jordan site was also located entirely on lacustrine clay, perhaps under even natural modern water levels (after allowing for the dams on the Abitibi River). The warmest, driest period in the Abitibi area is the 5900 to 4000 B.C. period prior to establishment of modern water levels (see Table 7 of this thesis). These time frames are compatible for the suggested age of the complex. The lanceolate projectile points, the large percussion shaped end scrapers, the trihedral adzes, the large bifaces, the Boreal Forest location, the settlement pattern on low areas now partially flooded, and paleo-environmental climatic data all strongly suggest that the Jordan site may be related to the Caribou Lake complex.

The Jessup Site (DdGw-2) and the Mount Goldsmith Quarry Site (DdGw-3)

The Jessup site, because of its demonstrated multi-component nature (Kritsch-Armstrong 1982) and large size, plus the fact it is primarily a quarry workshop site, is difficult to compare to other sites. Based on J. V. Wright's research (Wright 1972d), the Jessup site, and by extension at least some of the Mount Goldsmith Quarry operations, can be placed within the Shield Archaic Tradition (Wright 1972). At Jessup, lacking are the extremely large bifaces, large percussion chipped end scrapers, and crescentic flake blades such as those found at the (presumed) earlier Jordan site. There is a rich variety of cores and preforms at Jessup, but not a great number of finished bifaces or lanceolate projectile points or preforms. Thus, it was thought best to look for comparisons to the Jessup lithic workshop and its sister site, the Mount Goldsmith Quarry, in the form of other documented quarry/workshop situations.

The Jessup Shield Archaic site is closely related to the Abitibi Narrows Shield Archaic site (DeGx-1) (see Table 6) excavated by Frank Ridley (1966). The Abitibi Narrows materials plus material from DaGv-1, (Pearl Beach) (Pollock 1976:83), a multi-component site near Kirkland Lake, Ontario, contain a significant Shield Archaic component. The tool kit represented was thought to be so significantly different from other Shield Archaic sites, that in his M.A. thesis, John Pollock defined it as a separate Archaic phase, namely the Abitibi Narrows Phase. The existing definition of the Abitibi Narrows Phase is as follows:

> The tool kit of this phase consists of large percussion-flaked plano-convex predominantly quartzite implements, large biface blades, ovate blades, leaf-shaped bifaces, predominantly large crescentic end scrapers (over 10 gm), some small end scrapers, bifacial core chopping tools (turtle cores), core-derived lanceolate and stemmed projectile points. These implements are predominantly percussion flaked, and a low incidence of flake-derived tools is indicated (Ridley 1958, 1966; Pollock 1972, 1973).
>
> (from Pollock 1976:175)

This statement was further refined as follows:

> . . . large percussion flaked predominantly greywacke implements, large bifaces, ovate blades, leaf shaped bifaces, predominantly large crescentic end scrapers (over 10 grams), some small end scrapers, bifacial core chopping tools, core derived lanceolate and stemmed projectile points.
>
> (Pollock 1975c)

Since the earlier work, and as a result of this thesis research, it appears that there may be an earlier archaic phase in the region (i.e., an assemblage similar to the Caribou Lake complex represented by the Jordan Site).

In earlier years, Frank Ridley postulated some relationships between the Abitibi Narrows phase and the Sheguiandah site (1966:47). To the east in Quebec, Charles A. Martijn relates the A and B phases of the Wenopsk complex to the lower levels of the Abitibi Narrows site, but the connection is more a chronological than artifactual connection (Martijn and Roger 1969:335). Dean Knight (1971, 1979) did not see any direct connection between the Archaic components at the Montreal River sites and the Lake Abitibi materials, although some similarities exist in regard to scrapers and projectile points.

Other than at the Jessup and Mt. Goldsmith sites, the writer has conducted excavations in two other related sites; namely, area "C" of the Larder Lake (Pearl Beach) site (DaGv-1), and the Fretz site (DdHe-1), previously described by Wright (1972), on Moose Lake near Timmins. At DaGv-1, I conducted three separate excavations (comprising some 625 square feet) in 1973 (Pollock 1975a). It should be noted that at the Larder Lake site horizontal stratigraphy is present. Thus, the three separate areas excavated contained three separate components although some minor component mixture is present. Area "A" relates predominantly to the Duncan phase (Terminal Woodland), and area "B" to Laurel peoples, while area "C" represents a Shield Archaic Abitibi Narrows phase component.

In his 1978 paper, Thor Conway explored the relationship of the Jessup site to others in the region. He agrees with the writer that the closest relationship is to the Abitibi Narrows site, but he feels that because of raw material differences the site is only generally comparable to the Larder Lake (DaGv-1) and Fretz sites. More importantly he feels that there are few other sites on Lake Abitibi directly comparable to the Jessup site and none at all comparable to the Jordan site. In his summary, Thor Conway viewed the Jessup site materials as "a distinctive regional expression of the Lake Archaic/Initial Woodland Period in the Lake Abitibi area" (Conway 1978:6).

Turning to the Quebec side of the Lake, many years of research has been conducted here by R. Marois of the Archaeological Survey of Canada (1975) and prior to that by Thomas E. Lee (1965). Thomas E. Lee excavated during 1964 at the Louis, Iroquoian Point and Slate sites. Only a few pieces of Archaic material were recovered and these are too few for comparisons to the Abitibi Narrows Phase (Lee 1965:42), although some of the items may be related. Most of Marois' excavated sites on the Quebec portion of the lake have been late ceramic bearing sites or early historic sites with no archaic sites and only a few archaic artifacts represented (Marois 1975).

To the south around and near Lake Timiskaming there are large cores with a bifacial chopper industry (Knight 1969, 1971). Some of these cores were too large to be moved even by two people, and showed the effect of extremely large flake removals (Dean Knight: personal communication to John Pollock).

In his 1977 Ph.D. thesis entitled "The Montreal River and The Shield Archaic," Dean Knight illustrated two large bifaces, neither of which appear to be visually similar to the Jessup or Jordan specimens (Knight 1977:Plate 4, page 303). The thesis spans the time frame 300 B.C. to 180 B.C. Within this period he confirms two traditions in the study area. The first is the Shield Archaic with two phases, namely the Abitibi Narrows Phase (3000 - 2000 B.C.) and the Mattawan Phase (2000 -

800 B.C.) followed by the Eastern Laurel Tradition (500 B.C. to A.D. 500). It should be noted that John Pollock's original definitions of these phases (Pollock 1975, 1976) were confirmed and utilized in Dean Knight's thesis. Other area researchers, Conway (1978: personal communication), Hanna (1980:85), Noble (1980:26), and Kritsch-Armstrong (1982), have also used the Abitibi Narrows Phase as a recognized regional variant of the Shield Archaic Tradition. Knight also suggested in his study of the archaic peoples (about 100 km south of Lake Abitibi at the headwaters of the Ottawa River) that the archaic artifacts of the area reflect a local adjustment to the environment within a band hunting range encompassing most if not all of the seasonal sites and subsistence round activities (Knight 1977:291). A similar circumstance is probable for the Lake Abitibi sites.

Finally, Ingrid Kritsch-Armstrong's conclusion to her 1982 M.A. thesis confirms the designation of the Jessup site as a Shield Archaic lithic and habitation site (1982:258).

The Mount Goldsmith Quarry Site

Turning to the Mount Goldsmith Quarry site, one must go much further afield for comparative data. The nearest known quarry sites are the Sheguiandah Site (Lee 1953) on Lake Huron, and the Rogers Quarry Site on the east bank of the Temiscamie River in Quebec (Martijn and Rogers 1969:200). Both are quartzite outcrops that were quarried and/or surface collected for raw lithic materials by prehistoric peoples. The Rogers Quarry is typical of many quarries, including Mt. Goldsmith, in that many of the stone artifacts are problematical, and it is difficult to distinguish natural breakage of the stone from that caused by human agents. The next closest site is the Sheguiandah site on Manitoulin Island. It is a huge quarry containing many tonnes of material, several metres deep in places. No extensive excavations or research have yet been conducted at either site. It is interesting to note that some of the Lorraine quartzite from the Sheguiandah site locality has made its way to sites both at the Montreal River site on Lake Timiskaming (Frank Ridley: personal communication) and to the Jessup site itself on Lake Abitibi (Kritsch-Armstrong 1982:84). Also present at the Jessup site are tools made from greywacke, a lithic material which predominates in lithic tools from the Kirkland Lake area just south of Lake Abitibi (Pollock 1975c, 1976).

Much further afield, at the Bodie Hills Quarry site in Mino County, California, the majority of biface specimens found were broken or partially finished (as is the case at the Jessup site). As well, no hammerstones were located, and the authors (Singer and Ericson) tell us that "initial percussion for decortation or core preparation was accomplished by using a direct block on block or cobble to cobble technique (Singer and Ericson 1977:179). This feature is of interest, as no hammerstones have been located to date at the Lake Abitibi quarry; and it may be possible that blocks of the raw material itself were used as hammerstones for initial reduction and/or quarrying activities. Eight smaller hammerstones were recovered, however, from the Jessup lithic workshop site indicating use of these as percussors (Kritsch-Armstrong 1982:195).

In addition to the Singer and Ericson paper described above, work on other quarry sites has been conducted by Bryan and Tuohy 1960;

Losey 1974; Stiles, Hay and O'Neil 1974; and Gramly 1980. As well, Richard Gramly mentions several researchers who tried "to probe technological processes as well as the magnitude and duration of extraction industries . . ." (e.g., Bisson and Horne 1974; Mills 1922; Ritchie and Funk 1973; Gramly 1980:823).

Some recent ethnographic based studies on procurement of stone and aboriginal attitudes towards lithic material were examined by Gould, Koster, and Santz (1971) in regards to the western desert aboriginies of Australia. These data are interesting, as they state that the quarrying process used on scattered outcrops of chert and quartzite are varied. If there are pieces on surface a boulder is used to smash a few nodules or pieces. The desired flakes are then selected from the pile of debris. Of interest is the fact that "sometimes he preforms a little preliminary trimming by percussion-flaking on the spot; but more commonly, he carries the selected flakes away with him to trim at some later time" (Gould, Koster, and Santz 1971:161). This procedure by far seems to be the pattern at most quarry sites where desirable raw material is collected and then transported to another area for reduction into preforms or finished artifacts. It is certainly the pattern apparent at the Mt. Goldsmith Quarry outcrop site as no finished artifacts or preforms have been recovered at the bedrock source site in comparison to the multitude found at the nearby workshop and campsite. This pattern of collecting raw pieces of material and then reducing it at a nearby campsite into biface blanks or 'rough outs' was also reported at a basalt quarry in northeastern Oregon by Bryan and Tuohy (1960). Here, scattered basalt nodules were utilized as a raw lithic source. The percussion 'blade blanks' found are similar to such blanks found at the Jessup site and many other quarry workshops such as the Strathcona Science Park site (FjPi-29) near Edmonton, Alberta (Newton and Pollock 1979). Also comparable is the fact that only one habitation site was found in the quarry area (Bryan and Tuohy 1960:489).

Turning to Northern New Hampshire excavations at the Mt. Jasper rhyolite lithic source area, shallow audits were used by aboriginal peoples to mine the lithic material. Again, the main processing area is away from the immediate lithic outcrop or deposit, and is located below the mountain (Gramly 1980:3). As Gramly states, "the workshops on and below the mountain possess no special advantages apart from the direction of access. All are within a short distance of water" (Gramly 1980:3). This situation is directly comparable to conditions at the Mt. Goldsmith Quarry. As with the Mt. Goldsmith Quarry, at Mt. Jasper it was not possible, due to the lack of evidence, to reconstruct the mining process. However, the writer certainly agrees with Gramly's suggestion that the nature of mining operations may be quite variable within cultures and between cultural periods depending on transportation available and the season (and perhaps the type of finished tool desired) (Gramly 1980:8).

In northeastern Alberta, the Beaver Creek Quarry and related sites are based on lithic material derived from formerly unconsolidated sediments within bituminous sands (possibly part of the McMurray Formation) that were silicified. The unit is narrow (10 - 20 cm) and the degree of silicification varies greatly (Ives & Fenton 1983:78-88). In contrast to the Mt. Goldsmith and Jasper Mtn. quarry sites, at Beaver Creek the lithic workshop is located beside the quarry. This situation may be due to the fact that the quarry is itself located on a substantial creek used for travel and that it is also near a preferred environmental setting for sites in the area (i.e., the valley rim of a creek or river). It is interesting to note that similar to other discussed quarry sites, very few finished artifacts were recovered from the quarry or workshop areas (Losey 1974:V).

The practice of gathering raw lithic material at a nearby quarry and processing site to produce finished preforms or artifacts for transportation to other localities or use sites has a 1.6 million year history in human evolution, as documented at the M.N.K. chert factory site, Olduvai Gorge, Tanzania (Stiles, Hay, and O'Neil 1974). The quarrying and reduction procedure at this site is similar to the Beaver Creek Quarry, where the workshop is located near the source material and the flake debitage from the workshop site is larger than sites away from the quarry workshop area (Stiles, Hay, O'Neil 1974:304).

In summary, if one considers that the quarry site is the starting point or source for all lithic tool processes, then no study or lithic typology or technological traditions can be truly complete without an examination of the source and methods used to obtain the raw materials for tool manufacture. This conclusion is especially so as it is apparent that initial steps to produce stone tools are almost always undertaken at the quarry or a nearby quarry workshop. The unfinished tool blanks produced here are then transported to the other resource procurement localities during the seasonal subsistence round. Depending on need they are then processed into particular tools depending on the economic activity underway at that locale. Thus, quarry workshop blanks at one site may be used to make spears or projectile points for killing large mammals; at another site for blades and scrapers to process meat, fish, etc.; while at a third they may be used as woodworking tools for canoe manufacture, etc. By analyzing tools from these function-specific sites, important insights into the initial lithic production and distribution processes may be missed or misinterpreted. Clearly, the quarry sites, despite the inherent difficulties of excavation and analysis, are a very important part of archaeological lithic studies.

CHAPTER V

APPLICATION OF THE COGNITIVE APPROACH

Part One: The Historical Development of Experimental Archaeology

It is important to note that the purpose of the experimental thesis research was not to replicate stone tools in shape or form from the Lake Abitibi archaeological sites but rather the purpose was to replicate the technological repertoires and production 'grammars' used by particular prehistoric groups in the manufacture of stone tools. As the experimental research is central to the purpose of this dissertation a brief background history of the development of experimental archaeology is presented in order to provide a context for the thesis experiments.

Despite its lengthy history, experimental archaeology is still considered by many to be "no more than simple auxiliary data collection methods which are resorted to only on rare occasions to test the reasonableness of a belief concerning an artifact's usage or method of fabrication" (Saraydar and Shimada 1973:344).

In order to refute this notion, a number of works in the field are examined beginning with Ascher's 1961 definition of the experimental archaeology field as a "category of experiments which entails operations in which matter is shaped, or matter is shaped and used, in a manner simulative of the past" (Ascher 1961:793). Although somewhat narrowly stated, Ascher's definition marks the beginning of a major expansion of experimental archaeology. In 1973, Thomas R. Hestor and Robert F. Heizer published a major reference work in their Bibliography of Archaeology 1: Experiments, Lithic Technology and Petrography. This work marked an era of major expansion in the experimental field, with works on experimental lithic archeaology regarding controlled pressure flaking (Ackerby 1978), the role of abrasives in the formation of lithic use-wear (Brink 1978), experiments and definitions in flintworking (Crabtree 1971, 1972), prehistoric hide scraping (Levitt 1976), and experimentation in the formation of edge damage (Tringham et al. 1974) to name only a representative sample.

Despite its recent popularity, the role of experimentation in prehistoric studies, however, is neither new nor recent, extending well back in time to the late nineteenth century. Johnson L. Lewis, in a recent (1978) paper, has provided us with a lucid summary of the history of flintknapping experimentation as summarized in the following paragraphs.

Two of the earliest experimenters were Sven Nilsson, who commented on making gunflints, and Sir John Evans who described percussion and pressure flaking in 1868. It is interesting to note that the 1890-1899 decade is "the most prolific in reports of the entire period prior to the 1960s." Most important among the thirty-four papers published were those by William H. Homes (Lewis 1978:340).

The context of experimental work during the period 1890-1899 was the prevalent assertion that North American bifaces were not ancient despite the fact that they resembled European handaxes. Following the establishment of the above "fact," the majority of work over the next few decades is attributable to European researchers. Many papers during these times were concerned over the eolith controversy (an eolith is a crude problematical stone tool). The argument was over whether or not specific groups of items were of cultural origin or natural formations. S. Hasseldine Warren was one of the notable authors during the period. His 1913 paper describes his experiments in replicating natural fracture, percussion flaking, and pressure flaking (Warren 1913).

The 1920-1929 period saw little in the way of major papers and the eolith debate continued. One of the more notable publications was Pond's study of the knapping techniques of Halvor Skavlem (Pond 1930). It contains a discussion of the fracture mechanics and mentions the importance of raw material. During the 1930-1939 period one of the most important papers is by Wen Cung Pei (1936). This paper is concerned with distinguishing natural from human flaking and indeed should be useful to modern researchers (see Pei, 1936). Pei notes that while stones chipped on beaches, due to natural causes, bear little resemblance to those made by man, those chipped underwater are much more similar because of the absorption of vibrations by the water (Lewis 1978:390).

The remainder of Johnson's paper and a summary discussion detailing current trends in lithic experimentation deal with more recent papers. The main areas covered are heat treatments, mechanical nature of fractures, problematic artifacts, bipolar techniques, replication of artifacts, sequence of the lithic reduction process, and the study of individual variation and fracture processes. This article is of great use in providing time depth, and as a source of bibliographical references for modern researchers. One possible criticism is the fact that, if anything, the author understates the potential contribution of experimental archaeology to lithic technology.

Another useful reference monograph on early experimentation in archaeology is Thomas R. Hester and Robert F. Heizer's bibliography on lithic experiments (1973). During recent years Robson Bonnichsen, who made the experimental artifacts for the research presented in this thesis, has been one of several researchers who have carried on the work of early experimental archaeologists. Through his 1977 monograph on stone tools and a 1979 monograph on bone tools, he has made a major contribution to experimental archaeology and an understanding of technological processes at the aboriginal level.

In summary, it appears that in order to extend beyond the boundaries of traditional morphological analyses of shape and metrical attributes of prehistoric archaeological assemblages, an archaeologist should have a basic understanding of percussion and pressure flaking and other essentials of flintknapping. Without further research based on experimental work archaeological lithic analysis will find it ever more difficult to reach a higher level of understanding regarding aboriginal stone tools.

Part Two: Outline of Analytical Methods and Glossary of Technical Terms

An outline of analytical steps and methods used in the cognitive approach is presented here (Table 10) in order to allow the reader to follow the analysis and comparison of the experimental specimens and prehistoric artifacts. Much of the experimental analysis here is also discussed in Young and Bonnichsen (1984). It should be emphasized that this thesis is not intended to be a "cook book" for the application of the cognitive approach but is only one building block in a series of publications which will culminate in a definitive laboratory manual. The purpose of this thesis is to show that the method can be applied to a set of prehistoric data.

Following the initial outline of methodological steps in Table 10, a more detailed sequential breakdown of the methodology is given, ending with a glossary of technical terms.

Table 10: Outline Diagram of Analytical Methods

A. Experimental Specimens

1. Visual examination and tentative identification of some behavior units on prehistoric specimens are made.

2. Raw lithic materials for experiments are obtained.

3. A modern craftsman undertakes preparation of preforms and behavior unit experiments. All experiments are video taped for future reference.

4. Experimental specimens are coded on individual flake scar attribute coding forms and are photographed.

5. A final step involves the preparation of summary tables and componential analysis.

B. Prehistoric Artifacts

1. Coating of the prehistoric specimens with ammonium chloride (NH_3Cl) and stereo photography plus line drawings and numbering of individual flake scars.

2. Relevant flake scars are coded on individual flake scar attribute coding forms.

3. Prehistoric flake scar morphologies are related to experimental behavior unit flake scar morphology and an identification made in respect to the prehistoric scar.

C. Analysis

1. Preliminary metric and shape analysis (optional).

2. Summary tables of basic behavior units for each prehistoric artifact and site are compiled.

3. Next, summary tables of production units (behavior unit with function added) are prepared and results further summarized by means of a matrix chart and figure showing unique and shared production units for each artifact.

4. The final level of analysis concerns the sequencing of the preceding production units. First, flow diagrams showing how each artifact was made are produced and a matrix chart and a figure used to show

Table 10 continued.

to what extent sequencing of production units are shared by the prehistoric artifacts. On the basis of this information, conclusions are made regarding the amount of technological overlap within and between sites.

5. The final step is to produce a branch diagram of production strategies (Table 31) and repertoire(s). This is the final, most general level of analysis and constitutes the production grammar.

Details of Steps Outlined in Table 10:

A. Experimental Specimens

1. Before undertaking a technological analysis of artifacts from the Jordan and Jessup Sites, it was necessary to engage in some preliminary investigations designed to tentatively identify the type and range of flintknapping behavior used in the manufacture of the Lake Abitibi prehistoric bifaces.

In order to conduct these experiments with Robson Bonnichsen, the writer and David Young travelled to the University of Maine during December, 1980. A first step was to examine the prehistoric artifacts themselves to infer behavior units responsible for the morphological units (i.e., flake scars, platforms, etc.) observable on the specimen. In the case of the Lake Abitibi biface artifacts (both sites), the following behavior units were identified by Drs. Young and Bonnichsen and the writer. Previous experimental research on the flake scar morphology produced by these units was used as a reference base. For the Lake Abitibi artifacts the following behavior units, composed from variables in Table 11, were tentatively identified:

1. Moderate percussion thin with billet 3-41-51
2. Substantial percussion thin with billet 4-51-51
3. Minimal pressure shape with pressure flaker 2-32-31
4. Edge buffet with hammerstone or substitute 2-12-41
5. Edge abrade with grinder 1-11-41 (edge grinding)
6. Moderate percussion shape with hammerstone 3-42-41
7. Substantial percussion shape with hammerstone 4-42-41

Table 11: List of Common Behavior Units and Production Unit Components Used in Flintknapping

---

Column 1: Function

Series A: Core

01 Face-creating
02 Edge-dulling
03 Edge-thickening
04 Margin-contouring
05 Platform-isolating
06 Face-paring

Series B: Preform Edge

20 Edge-dulling
21 Edge-thickening
22 Edge angle-reducing
23 Edge-centering
24 Edge-straightening
25 Edge-regularizing

Series C: Preform Margin

30 Margin-regularizing
31 Margin-contouring
32 Margin-bevelling
33 Margin-moving
34 Platform-isolating

Series D: Preform Face or Side

40 Face-paring

Series E: Artifact Finishing

50 Notch/stem/barb-creating
51 Flute-creating
52 Contour-correcting
53 Edge-dulling
54 Base/stem-paring

Column 2: Extent of Effect

1 Very minimal
2 Minimal
3 Moderate
4 Substantial
5 Very substantial

Column 3: Type of Behavior

10 Rub:
    11 Rub abrade
    12 Rub buffet
    13 Pressure rub

20 Shear:
    21 Shear thin
    22 Shear shape

30 Pressure:
    31 Pressure thin
    32 Pressure shape

40 Direct percussion:
    41 Percussion thin
    42 Percussion shape

50 Indirect percussion:
    51 Percussion thin
    52 Percussion shape

Table 11 Continued.

Column 4: Tool

- 10 Edge-dulling tool (used to abrade or buffet):
  - 11 Stone
    - 111 Cobble (natural surface)
    - 112 Grinder (flat surface of small split cobblestone)
  - 12 Antler
    - 121 Small (such as side of pressure flaker)
    - 122 Broad (such as side of billet)

- 20 Shearer:
  - 21 Stone (flat surface of small cobblestone or grinder)
  - 22 Antler (side of tool such as pressure flaker)

- 30 Pressure flaker:
  - 31 Antler
  - 32 Wood
  - 33 Metal

- 40 Hard percussor:
  - 41 Hammerstone
    - 411 Small
    - 412 Medium
    - 413 Large

- 50 Soft percussor:
  - 51 Antler billet
    - 511 Small
    - 512 Medium
    - 513 Large
  - 52 Wood billet
    - 521 Small
    - 522 Medium
    - 523 Large

- 60 Punch (intermediate tool used in indirect percussion):
  - 61 Antler
    - 611 Pointed tip (such as tip of pressure flaker)
    - 612 Broad tip (such as tip of billet)
  - 62 Wood
    - 621 Pointed tip
    - 622 Broad tip

N.B. If variables are taken from all four columns the 4-digit number code is a production unit; if only the last three columns are used the 3-digit number code represents a behavior unit. This table is reproduced from a similar one in Young & Bonnichsen (1984:43). Definitions and explanation of terms used in the table are given in the glossary at the end of Part Two.

8. Substantial indirect percussion thin with billet (billet on billet) 4-51-51.

Number eight was a new unit. Examination of flake scars on the large bifaces suggested neither billet, hammerstone, nor pressure flake morphology. Attributes suggested a previous unknown combination of pressure and percussion; therefore, it was decided to try an experiment with indirect percussion, a technique only infrequently employed by modern knappers. The results of the initial experimental testing were quite successful, and in fact this technique may be one of great importance when very large bifaces are produced.

The next major step was the experimental isolation of significant technological attributes utilizing a living craftsman. First:

2. Raw lithic material, as close as possible to that used by the aboriginal peoples for the excavated artifacts, was obtained. In the case of the Lake Abitibi materials, the rock, a volcanic tuff, was obtained and shipped to Maine by the writer. A range of flintknapping materials from the bedrock formation was obtained similar to that found in artifacts at the archaeological sites (see Table 9).
3. Sixteen biface preforms were made. No attempt was made to replicate shape of existing bifaces and a variety of forms resulted. Of the sixteen biface preforms that were made, two broke leaving fourteen which were used for the subsequent experiments.

Before the experiments began, all experimental specimens were coated with white dye in order that the resulting flake scar morphology from each behavior unit would be clearly visible.

A number of basic experiments were devised to test assumptions about the behavior units identified on the prehistoric artifcts. These involved having the craftsman undertake one behavior unit on each side of the experimental specimens, such as unit 2-41-41, minimal percussion thin with hammerstone. Morpho-contrast sets contained on opposite sides of experimental specimens proved productive in comparing morphologies resulting from different behavior units. Altogether, some twenty-three basic behavior units were replicated on the fourteen experimental specimens by Dr. Bonnichsen as outlined in Table 12. These basic experiments on the Lake Abitibi materials covered a wide range of technological behavior choices; they include the technological repertoires of Bonnichsen and another modern knapper, Errett Callahan. All experiments were videotaped. Table 34 (in appendices) provides an abstracted script of the approximately two hours of black and white videotape which records the experiments. This videotape (#V-22-04-001) is on file at the University of Alberta, along with the experimental specimens and stereo photographs. All are available for reference purposes to other researchers.

As mentioned previously, experimental specimens one and four broke during the experiments and were not used, leaving a total of fourteen usable experimental bifaces. During the experiments, Bonnichsen commented that in general the Lake Abitibi lithic material "is similar to felsite although there are a lot of flaws in some pieces. The material has a fair bit of variation in texture or grain even within the same core. There are complex joint plain surfaces and cracks which have been 'healed' or filled in with silica. Surface raw material has been patinated due to acid forest

Table 12: Basic Experiments Undertaken With the Lake Abitibi Material Based on the Most Common Technological Behavior Units Used by Lithic Craftsmen

Edge Preparation Units:

Specimen	Code *	Behavior Unit
AB10-1(a)	(2-12-41)	Minimal rub buffet with stone
AB10-1(b)	(2-12-51)	Minimal rub buffet with billet
AB2-2(a)	(1-11-41)	Minimal edge abrade with hammerstone
AB2-2(b)	(2-32-31)	Minimal pressure rub with pressure flaker
AB2-2(c)	(2-13-31)	Minimal platform isolation with pressure rub

Thinning Units:

Specimen	Code	Behavior Unit
AB9-5(b)	(2-31-31)	Minimal pressure thin with pressure flaker
AB9-5(a)	(3-31-31)	Moderate pressure thin with pressure flaker
AB8-6	(4-31-31)	Substantial pressure thin with pressure flaker
AB16-7(b)	(2-41-41)	Minimal percussion thin with hammerstone
AB16-7(a)	(3-41-41)	Moderate to substantial percussion thin with hammerstone
AB5-9(a)	(2-41-51)	Minimal percussion thin with billet
AB5-9(b)	(3-41-51)	Moderate percussion thin with billet
AB7-10	(4-51-51)	Substantial percussion thin with billet
AB11-11	(4-51-51)	Substantial indirect percussion thin with billet on billet

Shaping Units:

Specimen	Code	Behavior Unit
AB6-13(a)	(2-22-30)	Minimal to moderate shear shape with pressure flaker
AB6-13(b)	(3-22-30)	Moderate to substantial shear shape with pressure flaker
AB13-15	(2-32-31)	Minimal pressure shape with pressure flaker
AB14-16(b)	(1-42-41)	Minimal percussion shape with hammerstone
AB14-16(a)	(3-42-41)	Substantial percussion shape with hammerstone
AB3-17	(4-42-41)	Moderate percussion shape with hammerstone
AB15-18(b)	(2-42-51)	Minimal percussion shape with billet
AB15-18(a)	(3-42-51)	Moderate percussion shape with billet
AB12-19	(4-42-51)	Substantial percussion shape with billet

* Production codes and behavior units derived from Table 11.

soils and weathering. Generally, the lithic material from locations 2 and 3 (see Table 9) is of a better quality, 'finer grained, denser and has a sharp translucent edge with good flaking qualities'" (R. Bonnichsen: videotape V-22-04-001:451-621).

4. Following the video taping of the experiments, (all or a representative sample of flakes were saved from each specimen) the experimental specimens were photographed in stereo (Plate 28) preparing the way for an individual flake scar analysis of the experimental bifaces as outlined in the following part.
5. Using the stereo photo as a base, line drawings were made of all flake scars (Figure 12). Scars on the line drawings were numbered providing a reference for each individual flake scar. Individual flake scar attribute coding forms were filled out for each of the twenty-three experimental behavior units (Tables 35 to 57, in appendices).

Componential analysis (Table 15) was used to illustrate and test the morphology in order to demonstrate that the morphological patterns relative to the experimental bifaces can be partitioned by attributes into a patterned clustering (Wallace 1972:115-16).

Finally, a written description of major behavior unit groups (i.e., pressure flaking), based on the experimental data and previous experiments, was given (see pages 186 to 193).

B. Prehistoric Artifacts

Please note that once sufficient reference collections for a wide range of raw lithic materials are established, it will not always be necessary for a researcher to undertake new experimental work.

1. Following the experimental work, the next step is to analyze the prehistoric archaeological artifacts. Each specimen is coated with ammonium chloride (NH_3Cl) and photographed in stereo photo pairs. Line drawings are made of both artifact faces.
2. Each scar is coded in terms of the same fourteen attributes and attribute states used for the experimental specimens (Table 13).
3. Once the prehistoric artifacts are coded, the attribute configurations on each prehistoric flake scar is identified on the basis of the closest matching experimental flake scar configuration (Table 17). Because it was the first attempt at such matching which I have called "scoring," I necessarily proceeded on a trial and error basis. Having undertaken such a laborious task by hand and having worked out the basic methodology, it is anticipated that on future research studies, attribute matching between experimental and prehistoric flake scars can be accomplished by computer programming.

C. Analysis

After the basic data has been gathered in the preceding steps, the next series of procedures is to process this basic data into higher levels of generalization.

1. If desired, a preliminary metric and shape analysis can be undertaken using more traditional methods of analysis (Figure 15).
2. Following this, behavior units for the prehistoric artifacts are listed on a summary table (Table 23) and then transformed into production units (Table 26) by assigning a function on an informed judgment basis, applied in a systematic fashion.
3. A matrix chart (Table 28) can be used to discover patterned

production unit results not obvious from the summary tables. Specimens with over 50% of shared production units are then isolated from the matrix chart and illustrated in a figure which shows the strength of artifact relationships (Figure 16).

4. The next level of the analysis is the sequencing of production units used to make the prehistoric artifact. It should be noted that, although beyond the behavior unit stage, the analysis is based on a selection of logical possibilities, the reasoning and basis for each are clearly documented throughout the analysis and therefore testable and replicatable by other researchers. The first step of the production unit sequencing analysis is to produce coded production unit flow diagrams for each artifact (Figures 17 and 18). Then a matrix chart (Table 30) is used to indicate the percent of shared production unit sequences between and within the two sites. Final production unit sequencing data can then be taken from the matrix chart and illustrated on a figure (Figure 19).
5. The final step is the defining of the repertoires and rules constituting the production grammars found at each site (Table 31).

Please note that one of the reasons the methodology used in this thesis is not suitable as a laboratory manual is that in order to use the just described procedures, a certain amount of expertise is needed in identifying and recognizing the attributes and attribute states, as well as in transforming behavior units into production units and sequences [illegible] production units.

Glossary of Technical Terms

1. Behavior Unit - A specific type of action performed by a craftsman; encompasses variables such as degree and angle of force, and a specific tool. It can be described in terms of attributes and attribute states. Types of behavior comprising behavior units (taken from column 3 of Table 11) and based on Young & Bonnichsen (1984:30-32) are as follows:

- Rub: Edge rub units involve rubbing the edge of the artifact to blunt it slightly. This strengthens the platform in preparation for subsequent flaking activity. Edge rubs are also used to isolate a platform or to smooth the edge after flaking activity has occurred. The amount of material removed is very minimal.
- Abrade: Rubbing the edge of the artifact with a back and forth movement, parallel to the edge, with an abrasive tool such as a rock (grinder).
- Buffet: Dragging a tool such as the flat side of an antler across the edge of an artifact.
- Pressure rub: Rubbing across the edge with the tip of a pointed tool such as a pressure flaker; usually the artifact is held flat so the pressure rub can be applied downward; if the tip of the pressure flaker is applied in an upward motion it can be referred to as a "pressure flick."
- Shear: Shearing involves pressing the flat side of a tool against the artifact edge and slowly twisting it (either perpendicularly or diagonally) across the artifact edge.
- Direct percussion: Percussion occurs when a tool such as a hammerstone or billet is used to deliver a blow to the topside or edge of

the artifact.

- Indirect percussion: Indirect percussion involves seating a tool such as an antler on the edge of the artifact and hitting it with another tool.
- Pressure: Pressure is the type of force that occurs when the tip of a pointed tool is set on the edge of the artifact and then pushed either inward and/or downward with increasing force.
- Thin: Thinning involves the removal of relatively long thin flakes from the underside of the artifact by the application of force at an acute angle to the edge of the specimen. Although the top face is slightly affected by the total or partial removal of the platform, the underside is much more drastically affected. The result is to thin the specimen much more rapidly than the margins are moved in.
- Shape: Shaping involves the more or less perpendicular application of force behind the edge on the top face of the specimen. This rapidly and efficiently removes large chunks of material we call shaping flakes. The result is to move the margins in at a much faster rate than the specimen is thinned.

2. Production Unit: A production unit consists of the behavior unit plus the function it serves. A behavior unit can have more than one function. Only the functions (taken from column 1, Table 11) discussed in this thesis are presented here. For a complete list with illustrations see Young and Bonnichsen (1984:39-42).

- Face paring: Face paring removes thinning flakes from the artifact face. A thinning flake is at least twice as long as the depth of the platform area.

- Margin moving: Margin moving involves removing a portion of the margin on both faces simultaneously in order to move the margins inward, thereby shaping the artifact.
- Edge-dulling: Blunting an overly-thin edge so it will not crush when used as a platform for the removal of flakes; can also be used to smooth an edge after the removal of flake.
- Edge-thickening: Removing the overly-thin edge with a pressure, percussion, or shear technique so the edge will not crush when used as a platform for the removal of flakes.
- Margin contouring: Removing material on the margin(s) of an artifact in order to achieve the desired thinness and curvature near the edge; margin contouring may involve reducing the edge angle (if the margin near the edge is overly-thick); if, however, the margin is too flat, contouring may require increasing the edge angle.
- Edge-centering: Removing material on the margins of both faces so that when viewed in cross-section, the edge where the two faces meet wavers as little as possible.
- Edge-straightening: Removing projecting material so that when viewed from the top (rather than in cross-section), the edge wavers as little as possible.
- Edge-regularizing: Edge strengthening, reducing, straightening, and centering - all in one operation; this is most efficiently accomplished with a shearing movement around the edge from one face to the other.
- Margin-regularizing: Removing irregularities on the margin of an artifact; a primary source of such irregularities are the inter-flake scar ridges left by the previous removal of flake; may also be used to

eliminate step fractures.

- Platform-isolating: Removing small notches on either side of area to be used as a platform for removal of a thinning flake; notching helps direct the force so it moves toward the center of the artifact rather than spreading out; sometimes a notch is used to provide a place to set the tip of a pressure flaker.

3. Morphological Attributes and Attribute States - These are used to define the behavior units on experimental specimens and prehistoric artifacts and are used in this thesis in Tables 2, 14, 15, 17 and 18. Table 13 defines the fourteen attributes and fifty-seven attribute states used in this thesis.

4. Morpho-Unit - These are individual flake scars resulting from a behavior unit.

5. Componential Analysis - Use of a matrix table to reveal how behavior units cluster in terms of attribute states. Shows pattern variation and can help to indicate attribute differences between raw material types.

6. Repertoire - The technical options available to a craftsman.

7. Grammar - The total repertoire of behavior units plus the rules governing their application.

N.B. The above glossary is based largely on Young & Bonnichsen (1984). Rather than duplicate their extensive definitions here, I have abstracted only ones relevant to this thesis.

Part Three: Attribute Coding of Individual Flake Scars on the Experimental Specimens

The analysis of each of the experimental specimens (as listed in Table 12) involves use of a master list (Table 13) comprising fourteen attributes and fifty seven attribute states. The attributes are arranged in a logical sequence beginning with the overall size of the flake scar, followed by four edge attributes, three flake scar profile attributes, four flake scar interior morphology attributes and two flake scar distal edge attributes. Within attribute variation is accounted for by the fifty seven different attribute states distributed among the fourteen attributes (see Table 14).

The above procedure is illustrated for the pressure thinning experiment (see Table 14). Plate 28 is one-half of a stereo pair of photographs of substantial pressure thinning, and Figure 12 is a line drawing based on this photograph. The same procedure was carried out for all of the behavior units employed in the experiments. The remaining experiments are coded and described in Appendix 4 (Table 36 to 57). After all the experimental artifacts are coded, the results are summarized in a componential paradigm (see following section).

Table 13

Morphological Attributes and Attribute States Used to Describe Flake Scars on Experimental Artifacts

1.0 Flake Scar Size Attributes:

1.1 Flake Scar Size (based on a ratio between the length of the flake scar and the maximum width of the artifact; measured from the point of force application):
   1.1.1 Very minimal (less than 1/8 maximum width)
   1.1.2 Minimal (1/8 - 1/4 maximum width)
   1.1.3 Moderate (1/4 - 3/8 maximum width)
   1.1.4 Substantial (3/8 - 1/2 maximum width)
   1.1.5 Very substantial (greater than 1/2 maximum width)

2.0 Flake Scar Proximal Edge Attributes:

2.1 Sharpness of Proximal Edge (based on tactile test):
   2.1.1 Sharp
   2.1.2 Intermediate
   2.1.3 Dull

2.2 Proximal margin damage (stepping, hinging, imbedded flakes or shattering along margin of proximal edge due to initial application of force):
   2.2.1 Absent or rare (0-10% of experimental flake scars exhibit this attribute state)
   2.2.2 Limited (10-25%)
   2.2.3 Moderate (25-50%)
   2.2.4 Extensive (50-75%)
   2.2.5 Very extensive (75-100%)

2.3 Microflake scars on Proximal Edge (a series of tiny edge indentations produced by the same action that removed the primary flake):
   2.3.1 Absent or rare (0-10%)
   2.3.2 Limited (10-25%)
   2.3.3 Moderate (25-50%)
   2.3.4 Extensive (50-75%)
   2.3.5 Very extensive (75-100%)

2.4 Morphology of Proximal Edge of Flake Scar (resulting from the type and extent of force applied when the flake is removed)
   2.4.1 Edge relatively straight (can be smooth or rough). No noticeable platform collapse
   2.4.2 Distinct U-shaped notch
   2.4.3 Notch is a flat curve
   2.4.4 Edge not notched but contains distinct convex projections
   2.4.5 Other

(Table 13 continued)

3.0 Flake Scar Profile Attributes:

3.1 Distinctiveness of Bulb (based on tactile test)
  3.1.1 Not Applicable
  3.1.2 Indistinct
  3.1.3 Distinct

3.2 Transition Angle From Bulb to Flake Scar Interior
  3.2.1 Not Applicable
  3.2.2 Gradual rise
  3.2.3 Steep rise

3.3 Flake Scar Thickness (depth of scar as measured from adjacent inter-flake ridges)
  3.3.1 Thin - 2 mm
  3.3.2 Thick - greater than 2 mm

4.0 Flake Scar Interior Morphology Attributes:

4.1 Ribs (waves extending toward distal edge from platform)
  4.1.1 Absent or rare (ribs occur in 0-10% of all flake scars produced by a given behavior unit)
  4.1.2 Limited (10-25%)
  4.1.3 Moderate (25-50%)
  4.1.4 Extensive (50-75%)
  4.1.5 Very extensive (75-100%)

4.2 Distinctiveness of Ribs
  4.2.1 Not applicable
  4.2.2 Indistinct
  4.2.3 Moderately distinct
  4.2.4 Pronounced
  4.2.5 Variable on same flake scar

4.3 Rib Spacing
  4.3.1 Not applicable
  4.3.2 Relatively far apart and fairly evenly distributed across flake scar
  4.3.3 Relatively far apart and found primarily on distal half of flake scar
  4.3.4 Relatively close together and evenly distributed across flake
  4.3.5 Relatively close together and found primarily on distal half of flake scar
  4.3.6 Variable on same flake scar

4.4 Tearing (a mass of short but parallel lines concentrated along or near the margins of the flake scar)
  4.4.1 Absent or rare (occur in 0-10% of all flake scars)
  4.4.2 Limited (10-25%)
  4.4.3 Moderate (25-50%)
  4.4.4 Extensive (50-75%)
  4.4.5 Very Extensive (75-100%)

(Table 13 continued)

5.0 Flake Scar Distal Edge Attributes:

5.1 Flake Scar Shape at Distal Edge
    5.1.1 Scar terminates in relatively straight distal edge
    5.1.2 Scar terminates in relatively rounded distal edge
    5.1.3 Scar terminates in irregular distal edge

5.2 Flake Scar Termination (relation between fracture surface and original surface at distal end of flake scar)
    5.2.1 Feather termination
    5.2.2 Step termination

Above attributes partially based on Young & Bonnichsen (1984:91).

Table 14: Individual Flake Scar Attribute Form - Experimental Specimen AB8-6 - Substantial Pressure Thin with Pressure Flaker

1.0 Experimental Specimen Catalogue Number: AB8-6

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 4, A4, #16

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Substantial pressure thin with pressure flaker. Two attempts were made during the experiment (videotape 5098-5202). The material is hard to pressure flake (R. Bonnichsen: personal communication).

2.1 Extent of Effect: substantial 4 (code numbers refer to Table 11)

2.2 Type of Behavior: pressure thin - 31

2.3 Tool Used: pressure flaker - 31

2.4 Total Flake Scars on Specimen: 4 (#5 is a failed scar not used in analysis)

2.5 Attributes on the following coding form are taken from Table 13:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal			
1.1.3 moderate	X	all	substantial force was used - material is very hard to pressure flake
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light	X	1,4	50%
2.2.3 heavy			
2.3 MICROFLAKES			
2.3.1 absent	X	all	100%
2.3.2 light			

2.3.3 heavy			
2.4 PROX. EDGE MORPH.			
2.4.1 straight			
2.4.2 U shaped notch	X	all	100%
2.4.3 flat curved notch			
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	all	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	all	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	all	100%
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X		50%
4.1.2 limited	X	1,2	only visible when held at angle in strong light
4.1.3 moderate			
4.1.4 extensive			

4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable			
4.2.2 indistinct	X	1,2	50%
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable			
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half	X	1,2	50%
4.3.6 variable			
4.4 TEARING			
4.4.1 absent			
4.4.2 light	X	2	25%
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	4	25%
5.1.2 rounded dist. edge	X	1,2,3	75%
5.1.3 irregular dist. edge			
5.2 SCAR TERMINATION			
5.2.1 feather	X	1,3,4	75%
5.2.2 step	X	2	25%

(feather predominates on failed specimen)

EXPERIMENT AB 8-6

SUBSTANTIAL PRESSURE THINNING WITH PRESSURE FLAKER

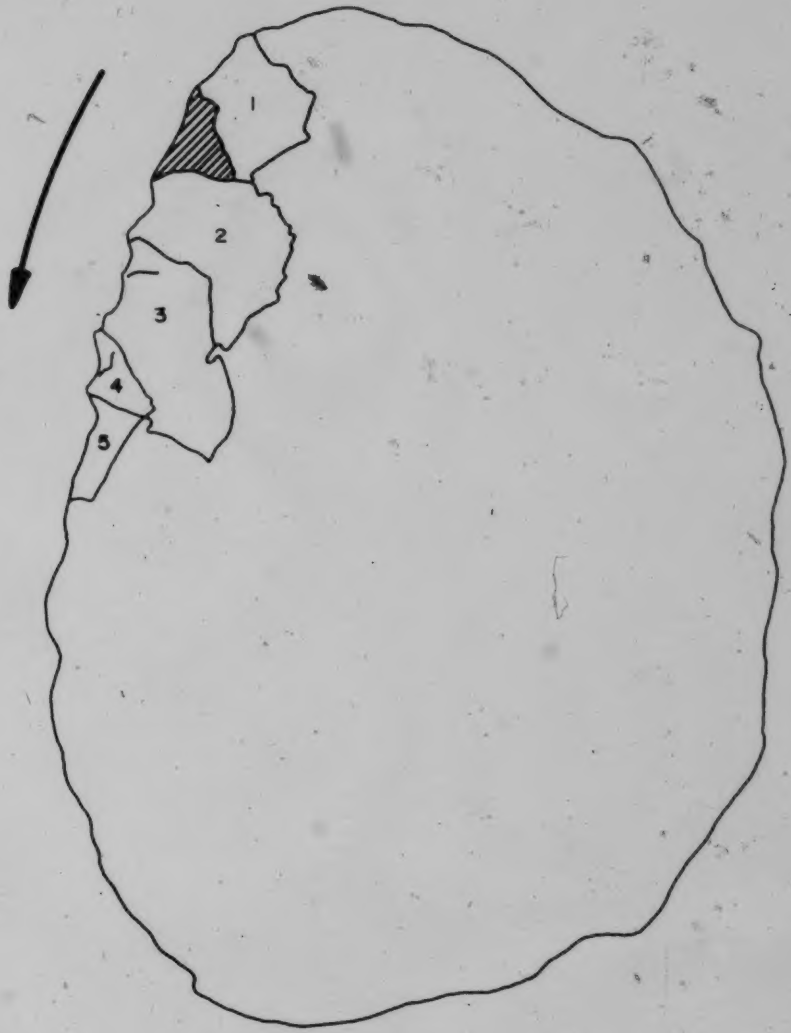


Figure 12: Line drawing of experimental specimen AB8-6.

0 5 10 20mm

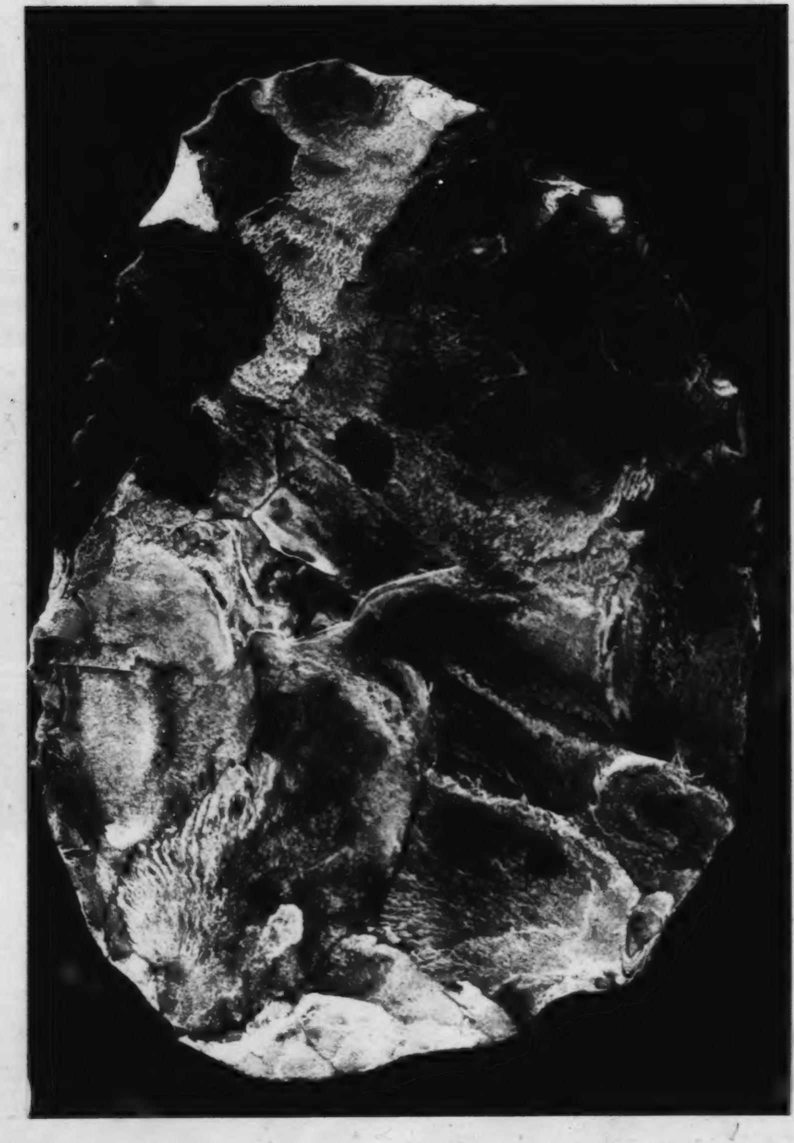


Plate 28. Photograph of experimental specimen AB8-6.
This photo is half of a stereo pair.

Componential Analysis

Componential analysis is important as it can be used to demonstrate that the different morph-units representing experimental behavior units are not random in nature but represent a systematic patterning (Wallace 1962:352-53). The componential analysis (Table 15) shows that there is a patterning of morphology related to specific groups of behavior units. Five different clusters are observable in Table 15. These clusters are as follows:- hard hammer percussion (hammerstone), soft hammer percussion (billet), pressure flaking and shearing, edge units (minimum percussion, rub buffet, rub abrades and pressure rubs), and finally, minimum platform isolating with a pressure flaker.

By demonstrating that morphological patterns specific to individual experimental artifacts cluster into patterns, the componential analysis helps to define the taxonomic system and present it diagramatically. Table 15 also demonstrates that no behavior unit overlaps or includes another and that every behavior unit is discriminated by at least one attribute. However, I do not argue that this is the only or even the best representation according to the arrangement of attributes, only that it appears adequate to show that the morphological separation of behavior units and their patterning is not random but follows a logical pattern. It is also important to point out that many of the blank spaces on the componential analysis chart are also "logical possibilities" (Sturtevant 1964:143) for behavior units, even though they have not yet been identified from experimental work or prehistoric specimens.

1·0 SCAR SIZE					VERY SUBSTANTIAL TO MINIMAL																	MINIMAL TO VERY MINIMAL				
2·1 EDGE SHARP					SHARP																	INTERMEDIATE		DULL		
2·4 PROXIMAL EDGE MORPH					U SHAPED NOTCH					50% STRAIGHT 50% CONVEX PROJECT	CONVEX PROJECTIONS	NOTCH & FLAT CURVE							FLAT CURVED NOTCH 66% STRAIGHT 33%	CONVEX PROJECTIONS	STRAIGHT					
2·2 PROXIMAL MARGIN DAMAGE					MODERATE	LIMITED			VERY EXTENSIVE	EXTENSIVE		MODERATE	NOT PRESENT	MODERATE	EXTENSIVE		MODERATE	NOT PRESENT	MODERATE	VERY EXTENSIVE		VERY EXTENSIVE	EXTENSIVE	MODERATE	RARE (7%)	VERY EXTENSIVE
2·3 MICROFLAKES					NOT PRESENT	NOT PRESENT			MODERATE	EXTENSIVE	MODERATE	RARE	NOT PRESENT	MODERATE	EXTENSIVE	MINIMAL	MODERATE	NOT PRESENT	NOT PRESENT	VERY EXTENSIVE		EXTENSIVE	NOT PRESENT	EXTENSIVE	NOT PRESENT	
4·1 to 4·3 RIBS					NOT PRESENT	RARE INDISTINCT FAR APART DISTR 1/2	NOT PRESENT					MODERATE INDISTINCT FAR APART DISTR 1/2	LIMITED INDISTINCT FAR APART DISTR 1/2	LIMITED INDISTINCT FAR APART EVENLY DISTR ON SCAR	NOT PRESENT	INDISTINCT RELATIVELY FAR APART DISTR 1/2	LIMITED INDISTINCT RELATIVELY FAR APART DISTR 1/2	NOT PRESENT	LIMITED INDISTINCT RELATIVELY FAR APART DISTR ON SCAR	NOT PRESENT						
4·4 TEARING					NOT PRESENT							MODERATE	LIMITED	VERY LIMITED INDISTINCT	MODERATE	EXTENSIVE	LIMITED	EXTENSIVE	LIMITED	NOT PRESENT						
INDISTINCT OR DISTINCT PERCUSSION BULB	GRADUAL AND STEEP TRANSITION	THIN OR THICK FLAKES	IRREGULAR	FEATHER														AB 11-11 INDIRECT PERCUSSION WITH BILLET								
			MOSTLY STRAIGHT	FEATHER AND STEP					AB 2-2(c) PLATFORM ISOLATION PRESSURE NOTCH							AB 12-16 SUBSTANTIAL PERCUSSION SHAPE WITH BILLET										
			ROUNDED AND IRREGULAR									AB 7-10 SUBSTANTIAL PERCUSSION THIN WITH BILLET														
			STRAIGHT OR ROUNDED OR IRREGULAR							AB 5-5(c) MINIMAL PERCUSSION THIN WITH BILLET			AB 5-9(c) MODERATE PERCUSSION THIN WITH BILLET				AB 12-16(b) MODERATE PERCUSSION SHAPE WITH BILLET									
					AB 6-6 SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER	AB 9-5(c) MODERATE PRESSURE THIN	AB 9-9(b) MINIMAL PRESSURE THIN			AB 16-7(c) MINIMAL PERCUSSION THIN WITH HAMMERSTONE				AB 16-7(c) MOD - SUB PERCUSSION THIN WITH HAMMERSTONE	AB 14-16(c) SUBSTANTIAL PERCUSSION SHAPE WITH HAMMERSTONE											
			STRAIGHT	PRED STEP SOME FEATHER															AB 3-17 MODERATE PERCUSSION SHAPE WITH HAMMERSTONE							
NOT PRESENT	NOT PRESENT	NOT PRESENT	STRAIGHT OR ROUNDED OR IRREGULAR	FEATHER AND STEP				AB 10-15 MINIMAL PRESSURE SHAPE WITH PRESSURE FLAKER												AB 2-21(c) MINIMAL PRESSURE RUB WITH PRESSURE FLAKER	AB 15, 15(b) MINIMAL PERCUSSION SHAPE WITH BILLET	AB 14-16 MINIMAL PERCUSSION SHAPE WITH HAMMERSTONE	AB 13-1(c) MINIMAL RUB BUFFET WITH HAMMERSTONE		AB 10-11(b) MINIMAL RUB BUFFET WITH ANTLER BILLET	
			STRAIGHT AND IRREGULAR	PRED FEATHER																				AB 6-15(c)(b) MIN - MOD [illegible] SHAPE WITH PRESSURE FLAKER		
			ROUNDED	FEATHER																						AB 2-2(c) MINIMAL RUB-ABRADE WITH HAMMERSTONE
3·1 PERCUSSION BULB	3·2 TRANSITION ANGLE	3·3 FLAKE THICKNESS	5·1 SCAR SHAPE DISTAL EDGE	5·2 SCAR TERM DISTAL EDGE																						

Table 15: Componential Analysis Chart

The componential analysis, I believe, indicates even with the relatively small numbers of experimental specimens, that behavior units can be isolated on the basis of morphological attributes. This analysis also allows one, at a glance, to compare other componential analysis charts for other raw lithic materials to the Lake Abitibi welded tuff. This, in the future, should allow for some general conclusions regarding the role raw material plays in formation of force attributes relative to each behavior unit.

Summary Analysis

The following descriptive summary is based upon the results of analysis of all the experimental behavior units, one example of which was discussed in the preceding section. The results of the total analysis can be found in Appendix 4. It should be noted that an edge unit, as used in this thesis, refers to behavior units that primarily affect the edge of the artifact in that they remove a minimal amount of material and do not extend far into the artifact.

Soft Hammer (Billet) Percussion

It should be noted that in the following discussions, "flake" refers to the negative flake scars left on bifaces, not the actual flakes themselves.

Substantial and moderate soft hammer (billet) flake scars share several attributes such as sharp edges, flat curved notches, and limited to extensive tearing in common with hard hammer.

Distinguishing and diagnostic features of soft hammer percussion are a tendency to have a distinct and deep percussion bulb extending well into the flake scar. Flake profiles tend to taper with a mixture of rounded and straight distal edges and a combination of feather and step terminations. Ribs, when present, begin past the percussion bulb and are relatively far apart on the distal end of the scar. Often, two distinct ridges are located near scar termination. Proximal edge damage varies but is generally present especially in areas of platform failure. Microflakes are rare to moderate and are generally less than that found on hard hammer specimens although the range overlaps. Tearing is moderate to extensive and tends to be more pronounced than hard hammer percussion. The other behavior which produces a similar morphology is indirect percussion. Some problems can be anticipated in separating direct percussion with a billet and indirect percussion with a billet under some conditions such as when direct percussion flakes are removed from a ground platform allowing the removal of very large and relatively thin flakes. Minimal soft hammer (like minimal hard hammer percussion) has quite a different attribute regime than the substantial to moderate flakes. In minimal soft hammer percussion, the edge is sharp with extensive to very extensive margin damage with moderate to very extensive microflakes, straight proximal edge or straight with convex projections, and no distinguishable percussion bulbs. Straight and irregular plus rounded distal flake edges are found along with both feather and step terminations (with a tendency towards feather terminations). Generally, minimal billet percussion is similar to other minimal units such as minimum pressure rub with an antler pressure flaker and therefore may be difficult to separate on prehistoric specimens.

Indirect Percussion

Indirect percussion flake scars are usually large spatulate flakes with a flat curved notch for a platform area. There are ribs in some cases (33.3%) but no microflaking on the experimental specimens. Ribs are generally found on the distal half. Tearing is light on the lateral margins. The negative bulb of percussion can be distinctive (33.3%) or indistinct (66.6%). The flake scar rises at a gradual angle and is very flat in cross section. Flakes have an irregular distal edge with feather terminations.

Indirect percussion appears to have characteristics that fall between billet percussion and pressure flaking. Further research needs to be done on this behavior unit to define the range of attribute states and to separate it more definitively from substantial billet percussion thinning, especially when billet percussion follows platform preparation such as abrading.

Hard Hammer Percussion

Substantial and moderate hard hammer (hammerstone) flakes have sharp edges, flat curved notches in the platform area and limited to extensive tearing. These attributes are shared with soft hammer or billet percussion.

Distinguishing features of hard hammer percussion are a strong tendency to have an indistinct negative percussion bulb and flat, thin flakes (not tapering like billet flakes) with predominantly straight and stepped terminations. Ribs, when visible, are indistinct, relatively far apart, and evenly distributed across the scar. Proximal edge damage overlaps with billet percussion. In contrast to the above thinning flakes, some hammerstone shaping flakes can have distinct percussion bulbs but these are associated with short flakes used for moving in the margins of the artifact (D. Young: personal communication). On both thinning and shaping scars, microflaking is common and found at moderate to extensive levels. Tearing is limited to moderate at the moderate and substantial force levels but disappears at limited force levels.

Minimal hard hammer percussion is quite different, having no percussion bulbs, small scars and an intermediately sharp edge only. The proximal edge is straight and margin damage is very extensive. Flake scar terminations are generally straight and either stepped or feathered. The minimal percussion closely resembles rub buffets and other minimal percussion and pressure units.

It should also be noted that in some experiments other than the ones in this thesis, if the craftsman properly prepares the edge and does not take too much material in striking the platform, hard hammer flakes will terminate predominantly in a feathered fashion (D. Young: personal communication).

The preceding discussion of billet and hammerstone flaking is in reference to biface thinning flakes, not initial stages of core reduction. Numerous researchers (Crabtree 1972, Solberger 1976) have stated that hammerstone usually produces a distinct bulb of percussion and this is the case in primary core reduction and some substantial hammerstone shaping flakes. However, our definition of hammerstone flakes refers to biface thinning flakes. It is instructive to note that Patterson and Solberger state (1978:107), "contrary to some popular concepts, flakes made with a hard hammerstone do not necessarily have a high percentage of concentrated force bulbs. . . ." Patten (1980:17) states that a soft to medium hammerstone produces flat, thin flakes useful in the final stages of tool finishing. In commenting on Patten's article, Errett Callahan (1980:18) states, "now that we know soft (to medium) hammers are capable of doing work confused with billet, let's get down to brass tacks and define the real but subtle differences that exist between the two." Finally, Solberger (1981:15) asserts that hammerstones can also produce the "lipped" flakes often stated as being diagnostic of soft hammer. It is apparent from this that more experiments need to be done to define the effect of percussion tool type on percussion bulbs.

Pressure Flaking

Pressure flake scars have sharp edges in common with percussion flakes but otherwise are quite different. Common to all forms of pressure flaking are U-shaped notches on the proximal edge, limited to moderate margin damage and a lack of microflakes. Some pressure thinning flakes have indistinct ribs, relatively close together and evenly distributed across the scar. Tearing is not common. Scar shape at the distal edge can be rounded with some straight or irregular edges. Terminations are predominantly feather but there are also some step terminations.

It should be noted that in some special cases a thick, strong, well prepared edge can be used to remove substantial pressure flakes without the platform collapse that causes a U-shaped notch. In this case, the remnant platform edge will be straight (e.g., microblade cores). The edges of the bifaces under study here, however, are seldom strong enough to support such pressure flaking. A distinctive attribute of pressure flaking is the "pinching" of the pressure bulb. This means that the bulb does not extend across the entire width of the platform as, for example, in billet percussion. Sometimes small imbedded flakes are also present in the pressure bulb at the point of the pressure flaker contact.

Pressure shape flakes have more edge damage and more platform collapse (i.e., more U-shaped notches) leaving a rough and irregular edge. This distinguishes them from pressure thinning flakes.

Rub Buffet, Pressure Rub, Rub Abrade, Shear Shaping and Platform Isolating (All Edge Units)

Some of these units are similar to minimum percussion shape (with billet and hammerstone).

Pressure rub and minimal percussion shape with billet both have sharp edges. Minimum percussion shape with hammerstone and minimal rub buffet with hammerstone both have intermediate sharp edges. Minimal rub buffet with antler billet, minimal shear shape with pressure flaker, and minimum rub abrade with hammerstone, all have dull edges. Most proximal edge morphology is either straight or the attribute follows the existing preform edge. Minimal pressure rub with pressure flaker, however, leaves convex projections on the edge.

All have in common a lack of ribs, very minimal to minimal flake scar size, and a lack of tearing.

Flake shape at distal edge varies among straight, rounded, and irregular terminations with the following two exceptions. Minimal rub abrade with hammerstone produced 100% rounded scars with 100% feather terminations, while minimal rub buffet with antler billet produced 100% irregular scars with 92% feather terminations. Minimal rub abrade with hammerstone produced 100% rounded scars with 100% feather terminations, while minimal rub buffet with antler billet produced 100% irregular scars with 92% feather terminations.

Minimal platform isolating with a pressure flaker (AB2-2c) is distinct from all other units. It has a sharp edge, no ribs, a U-shaped notch and extensive margin damage. Scars have indistinct bulbs rising steeply with curved bottoms with a 'scalloped effect' or troughing effect that produces distinctive flake scars. There are often tiny little pressure platforms produced by the tip of the pressure flaker.

Although some units, such as minimum percussion thin with a billet and minimum percussion thin with a hammerstone, are quite similar in morphology (heavy edge damage, heavy microflakes, straight proximal edges), other edge units have some generalized distinctions which can be used to identify them. Minimum pressure rub with pressure flaker produces minimum sized flakes with sharp edges and heavy margin damage and microflakes, see experimental specimen AB2-2b). Proximal edge morphology is straight with convex projections and occasional U-shaped notches.

Shear shaping, with a pressure flaker (experiment AB6-13), produces an irregular surface or 'face' with a rough topography due to overlapping scars and pressure bulbs — flake scar outlines are usually not clear. If a projection is present, shearing will remove this and sometimes take off a large flake in the process (D. Young: personal communication).

Rub buffets produce flat little scars (experiment AB10-1) sometimes with straight terminations. Scars do not overlap as in shear shaping and are generally distinct. Scar removal is not continuous along the edge.

Part Four: Analysis of the Prehistoric Artifacts

In a similar fashion to the experimental specimens, each prehistoric artifact selected for analysis is photographed in stereoscopic photo pairs and then line drawings are made of each of the artifact faces. Each flake scar on the line drawing is numbered starting at the top right hand margin. Again, each scar is coded in terms of the attributes found in Table 14. In contrast to the experimental artifacts where all scars could be coded together as the extent of effect, type of technological behavior and tool used is known, for the prehistoric artifacts each scar must be coded separately (some attributes are only recorded as present or absent) for each of the fourteen attributes. This is because in most cases there are overlapping technological behaviors and tools represented in the prehistoric artifacts. Therefore, the writer has designed a separate form (Table 18) to be used when coding flake scar attributes on prehistoric archaeological artifacts. As each prehistoric artifact analysis requires extensive stereo paired photographic work of both artifact faces and detailed coding, a sample of six prehistoric specimens judged to be representative from each site were used for the individual flake scar attribute analysis.

From the available sample total of large and medium sized bifaces from the Jordan site, six were selected on a judgmental basis for detailed analysis in this thesis; two of the four large bifaces shown in Plate 6 and six of the twenty-four medium sized bifaces shown in Plate 7. For sites with larger total samples to draw from a random or stratified random sampling method might be considered.

As with the Jordan site, six artifacts were selected from the Jessup site from those shown in Plate 13.

The details of how these prehistoric artifacts were coded is presented in the following sample analysis (Table 18) for one artifact. These standardized analysis forms contain the photographs, flake scar drawings and coding procedure necessary to analyze prehistoric artifacts. Data on the remaining prehistoric artifacts is contained in the appendices.

The prehistoric analysis differs substantially from the experimental artifact analysis in that a system of scoring is used to match the prehistoric morphological attributes to the experimental behavior units (Table 17).

Table 17 is a complex table based on the attribute data abstracted from the experimental analysis tables. In this table the percentage or average of the various attributes states for each behavior unit has been taken from the appropriate experimental specimen coding form (e.g., Table 14 - substantial pressure thin with a pressure flaker specimen AB8-6). The "%" signs on the table indicate the values to be used in the scoring system when prehistoric attributes are matched to the experimental specimens. For future studies it is anticipated that computer programming will be used to match up attributes between the experimental specimens and prehistoric artifacts, thereby producing a behavior unit identification. The computer can also be used to conduct a probability analysis and an estimation of the correctness of the identification. This will eliminate a lot of manual work and speed up considerably the time needed for analysis.

Following Table 17, another table (Table 18) is used as an example to show how a prehistoric artifact (C01073 Jordan Site) is coded and interpreted utilizing the scoring system and data contained in Table 17. To facilitate this, Table 18 was designed to list the fourteen prehistoric flake scar attributes (Section 2.2 of Table 18). Sometimes not all fourteen attributes are present or codable on the prehistoric flake scar and in this case the procedure proceeds with the available attributes. Ten seems to represent an average number of available attributes. If, however, the number of codable attributes drops below six, the chances of making a positive identification decreases substantially. Once the prehistoric attributes are recorded, a comparison is made between each prehistoric attribute and its experimental counterparts (which are listed in Table 17). Comparisons are not made to all experimental behavior units as some are clearly inappropriate, as for example, comparing attributes from a substantial prehistoric flake scar with the attributes from minimum sized experimental flake scars. Generally, three to five comparisons are sufficient to cover the range of possibilities.

As many of the experimental attributes contain within them a number of attribute states, some method of comparison had to be found to evaluate which experimental behavior unit most closely matched the prehistoric morpho-unit. To this end, a method of scoring was used in which each attribute was assigned a value of + 1 in the case of an attribute match or a - 1 in the case of a mismatch. If attribute states were involved, a partial match received a partial score. For example, the experimental behavior unit "substantial percussion thin with hammerstone" has flake scars that terminate 60% of the time in step fractures and 40% of the time in feather fractures. Thus, if the prehistoric flake scar being compared had a feather fracture, its score in the hammerstone comparison would be + 40 - 60 for that particular attribute. If the experimental behavior unit was negative for an attribute and the prehistoric specimen is also negative a + 1 is given. If the attribute is not present on the prehistoric specimen (i.e., has been removed by subsequent edge retouch as in the case of many edge attributes), the attributes are scored n/a and are not included in the analysis. For attribute 4.1 (ribs), if ribs are not present a score is given for this attribute only and the following two rib attributes are scored n/a.

Edge treatment units (in contrast to individual platform preparation) generally extend along a major portion of an edge. In order to increase the accurate identification of these edge treatment units, they are first identified on the artifact margins and that portion of the edge scored as a whole. A separate page is used to score edge units. Both sides of the edge are usually coded together, but if the edge treatment is unifacial, a note is made of that fact. In summary, each complete flake scar on a prehistoric attribute is seen as a natural unit of analysis and that portion of the edge which has received the same treatment is also seen as a natural unit of analysis. Prehistoric flake scars that have been severely overlapped — have had the proximal portions largely removed (remnant scars) — or failed scars (for example, a thinning flake that severely crushed the platform and terminated in a steep hinge fracture) are not suitable candidates for identification and are disregarded.

Once the scars are coded and scored, the positive and negative scores are added at the bottom of the form and then expressed as a per cent (%) of total available attributes. The resulting score (for example a + 68) is then compared to a scoring scale (see Table 16) for an evaluation of the probability of positive identification. A score of + 68 then, would indicate a highly probable identification as compared to a score of + 18 which would indicate a much lower matching of attributes and would rate only an indeterminate identification. In some cases, scores are close together, meaning that the prehistoric scar could be assigned to more than one behavior unit. Then an argument can be made for not giving a specific identification. Or, on the basis of judgmentally weighing some particular attribute thought to be more diagnostic (i.e., rib distribution), an identification can be made and the reasoning noted.

Table 16

+/-, % SCORING SCALE FOR FLAKE SCAR IDENTIFICATION

	highly improbable		unlikely		indeterminate		possible		highly probable	
- 100%		- 66.6%		- 33.33%	0% (50+) (50-)	+ 33.33%		+ 66.66%		+ 100%

To Get % Score

1. A 50% overlap is scored as a zero on this scale.
2. Compute score by computing the difference between positive and negative scores.
3. Divide score by total # of attributes to get %.
4. Find appropriate category on above scale.

Summary Remarks

Table 17, as mentioned, is a lengthy table which contains the summary of experimental attribute data for each experimental specimen. The next table (Table 18), also a lengthy one which contains the basic technological data for prehistoric artifact C01073 from the Jordan site, is used as an example. The remaining specimens are analyzed in the appendices. Part one of Table 18 contains basic artifact descriptive data on page 214. This is followed by many pages of data relating to individual flake scars. Each flake scar coding sheet designated as 2.0 - 2.1 (see page 215) is followed by an interpretation or identification sheet (see page 216). On this page the attributes or coding on the prehistoric scar is matched up against the most logical possibilities from the experimental collection as summarized in Table 17 and a behavior unit identified (Section 2.3). These steps (2.1 to 2.3) (i.e., identification or coding of prehistoric attributes and their identification through comparison to the experimental specimens) are repeated for each flake scar and form the bulk pages in Table 18. The results from each flake scar identification are then summarized in part 2.4 of the table on page 257. On page 259 a discussion of how behavior units are transformed into production units is given for each flake scar. The resulting production units are placed into a sequenced flow diagram of production units on page 260. The table is concluded with a written description (page 261) of the technological grammar illustrated in the flow diagram along with photographs and line drawings of the artifact.

Similar analysis of the other prehistoric specimens included in the study are found in Appendix 5.

Table 17: Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part One: Billet Percussion (all numbers represent average attribute presence or absence expressed as a percentage)

ATTRIBUTE	AB7-10 Sub. Percussion Thin With Billet	AB5-9(b) Moderate Percussion Thin With Billet
1.1 Scar Size	sub. to very sub. 100%	mod. to sub. 100%
2.1 Edge Sharp.	sharp 100%	sharp 100%
2.2 Margin Damage	absent 50% light 50% heavy = 0	absent 40% light 60% heavy = 0
2.3 Microflakes	0	absent 60% light 40% heavy = 0
2.4 Prox. Edge Morph.	irregular 25% flat curved notch 75% (some irreg. on failed scars)	flat curved notch 100%
3.1 Percussion Bulb	indistinct 75% distinct 25%	indistinct 80% distinct 20%
3.2 Transition Angle	gradual 75% steep 25%	gradual 80% steep 20%
3.3 Flake Thickness	thin 50% thick 50%	thin 50% thick 50%
4.1 Ribs	absent 50% present 50%	absent 80% present 20%
4.2 Dist. Ribs	indistinct 100%	indistinct 100%
4.3 Spacing Ribs	far apart on distal half 100%	far apart on distal half 100%
4.4 Tearing	absent 75% light 25% heavy - 0	absent 80% light 20% heavy - 0
5.1 Scar Shape Distal Edge	50% rounded, 50% irregular	40% rounded, 60% straight
5.2 Scar Termination	25% feather 75% step	50% feather 50% step

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part One: Billet Percussion

ATTRIBUTE	AB5-9(a) Minimal Percussion Thin With Billet	AB12-19 Substantial Percussion Shape With Billet
1.1 Scar Size	minimal 77.8% moderate 22.2% (code as 100%)	substantial 100%
2.1 Edge Sharp.	sharp 100%	sharp 100%
2.2 Margin Damage	heavy 100%	heavy 100%
2.3 Microflakes	heavy 100%	0
2.4 Prox. Edge Morph.	straight with convex projections 100%	flat curved notch 100%
3.1 Percussion Bulb	indistinct 100%	indistinct 100%
3.2 Transition Angle	gradual 100%	gradual 100%
3.3 Flake Thickness	thin 88.9% thick 11.1%	thin 75% thick 25%
4.1 Ribs	0	absent 75% present 25%
4.2 Dist. Ribs	0	indistinct 100%
4.3 Spacing Ribs	0	rel. far apart on distal half 100%
4.4 Tearing	absent 88.9% light 11.1% heavy = 0	absent 75% light 0 heavy 25%
5.1 Scar Shape Distal Edge	22% straight, 34% rounded, 44% irregular	75% straight, 25% rounded
5.2 Scar Termination	55.5% feather, 44.5% step	100% feather

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part One: Billet Percussion

ATTRIBUTE	AB15-18(a) Moderate Percussion Shape With Billet	AB15-18(b) Minimal Percussion Shape With Billet
1.1 Scar Size	moderate 100%	minimal 100%
2.1 Edge Sharp.	sharp 100%	sharp 100%
2.2 Margin Damage	absent 57.15% light 0 heavy 42.85%	heavy 100%
2.3 Microflakes	absent 71.4% light 28.6% heavy = 0	absent 20% heavy 80% light = 0
2.4 Prox. Edge Morph.	flat curved notch 57.15% straight 42.86%	straight 100% (some covex projections/ inter ridges)
3.1 Percussion Bulb	indistinct 85.72% distinct 14.28%	0
3.2 Transition Angle	gradual 100%	0
3.3 Flake Thickness	thin 85.72% thick 14.28%	0
4.1 Ribs	absent 85.72% present 14.28%	0
4.2 Dist. Ribs	indistinct 100%	0
4.3 Spacing Ribs	relatively far apart on distal half 100%	0
4.4 Tearing	absent 85.72% light 14.28% heavy = 0	0
5.1 Scar Shape Distal Edge	57.1% straight, 42.9% rounded	80% straight, 20% rounded
5.2 Scar Termination	71.4% feather, 28.6% step	80% feather, 20% step

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part One: Billet Percussion

ATTRIBUTE	AB11-11 Substantial Indirect Percussion Billet on Billet (also use to code mod.)
1.1 Scar Size	very substantial 33.3% to substantial 66.7% (code as 100%)
2.1 Edge Sharp.	sharp 100%
2.2 Margin Damage	absent 66.7% light 33.3% heavy = 0
2.3 Microflakes	absent 33.3% light 66.7% heavy = 0
2.4 Prox. Edge Morph.	flat curved notch 100%
3.1 Percussion Bulb	indistinct 66.7% distinct 33.3%
3.2 Transition Angle	gradual rise 100%
3.3 Flake Thickness	thin 100%
4.1 Ribs	absent 66.7% present 33.3%
4.2 Dist. Ribs	indistinct 100%
4.3 Spacing Ribs	mostly far apart on distal half 100%
4.4 Tearing	absent 66.7% light 33.3% heavy = 0
5.1 Scar Shape Distal Edge	irregular 66.7% rounded 33.3%
5.2 Scar Termination	feather 100%

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part Two: Hammerstone Percussion

ATTRIBUTE	AB16-7(a) Mod. and Sub. Percussion Thin With Hammerstone	AB16-7(b) Minimal Percussion Thin With Hammerstone
1.1 Scar Size	mod. (60) and sub. (40) 100% (code as 100% for sub. and mod.)	minimal 100%
2.1 Edge Sharp.	sharp 100%	sharp 100%
2.2 Margin Damage	absent 0 (N.B. extensive on failed scars)	absent 34% heavy 66% light = 0
2.3 Microflakes	absent 60% light 40% heavy = 0	absent 50% heavy 50% light = 0
2.4 Prox. Edge Morph.	flat curved notch 100%	straight (with convex projections) 100%
3.1 Percussion Bulb	indistinct 100%	indistinct 100%
3.2 Transition Angle	gradual rise 100%	gradual 100%
3.3 Flake Thickness	thin 80% thick 20%	thin 100%
4.1 Ribs	absent 20% present 80%	0
4.2 Dist. Ribs	indistinct 100%	0
4.3 Spacing Ribs	far apart, evenly dist. 100%	0
4.4 Tearing	absent 60% light 40% heavy = 0	0
5.1 Scar Shape Distal Edge	60% straight, 40% rounded	50% straight, 50% rounded
5.2 Scar Termination	60% step, 40% feather	83.4% feather 16.6% step

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part Two: Hammerstone Percussion

ATTRIBUTE	AB14-16(a) Substantial Percussion Shape With Hammerstone	AB3-17 Moderate Percussion Shape With Hammerstone
1.1 Scar Size	substantial 100%	minimal 66.7% moderate 33.3%
2.1 Edge Sharp.	sharp 100%	sharp 100%
2.2 Margin Damage	heavy 100%	absent 33.3% heavy 66.7%
2.3 Microflakes	absent 66.7% light 33.3%, heavy = 0 (part of margin damage)	0
2.4 Prox. Edge Morph.	flat curved notch 66.7% straight 33.3%	straight 33.3% flat curved notch 66.7% all others = 0
3.1 Percussion Bulb	indistinct 100%	indistinct 100%
3.2 Transition Angle	gradual 100%	gradual rise 100%
3.3 Flake Thickness	thin flakes 100%	thin 100%
4.1 Ribs	absent 66.7% present 33.3%	absent 66.7% present 33.3%
4.2 Dist. Ribs	indistinct 100%	indistinct 100%
4.3 Spacing Ribs	far apart distributed 100%	far apart distributed 100%
4.4 Tearing	absent 66.7% light 33.3% heavy = 0	absent 66.7% light 33.3%
5.1 Scar Shape Distal Edge	66.7% irregular 33.3% straight	straight 100%
5.2 Scar Termination	66.7% feather 33.3% step	33.3% feather 66.7% step

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part Two: Hammerstone Percussion

ATTRIBUTE	AB14-16(b) Minimal Percussion Shape With Hammerstone
1.1 Scar Size	very min. 66.7% minimal 33.3%
2.1 Edge Sharp.	intermediate 83.3% sharp 16.7%
2.2 Margin Damage	heavy 100%
2.3 Microflakes	0
2.4 Prox. Edge Morph.	straight 83.3% U-shaped notch 16.6%
3.1 Percussion Bulb	0
3.2 Transition Angle	0
3.3 Flake Thickness	0
4.1 Ribs	0
4.2 Dist. Ribs	0
4.3 Spacing Ribs	0
4.4 Tearing	0
5.1 Scar Shape Distal Edge	33.3% straight 66.7% rounded
5.2 Scar Termination	33.3% step 66.7% feather

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part Three: Pressure Flaking

ATTRIBUTE	AB8-6 Substantial Pressure Thin With Pressure Flaker	AB9-5(a) Moderate Pressure Thin
1.1 Scar Size	moderate flakes 100% (due to hardness of mat.)	minimal 33% (code as moderate 67%)
2.1 Edge Sharp.	sharp 100%	sharp 100%
2.2 Margin Damage	absent 50% light 50% heavy = 0	absent 78% light 22% heavy = 0
2.3 Microflakes	0	0
2.4 Prox. Edge Morph.	U-shaped notch 100%	78% U-shaped notch 22% flat curved (failed scars)
3.1 Percussion Bulb	indistinct 100%	indistinct 100%
3.2 Transition Angle	gradual rise 100%	gradual rise 100%
3.3 Flake Thickness	thin 100%	thin 100%
4.1 Ribs	present 50% absent 50%	present 22.2% absent 77.8%
4.2 Dist. Ribs	indistinct 100%	indistinct 100%
4.3 Spacing Ribs	relatively close together 100% (mostly on distal half, some evenly dist.)	relatively close together 100%
4.4 Tearing	absent 75%, light 25%, heavy = 0	0
5.1 Scar Shape Distal Edge	75% rounded 25% straight	55.6% straight 11.1% rounded 33.3% irregular
5.2 Scar Termination	75% feather 25% step	77.8% feather 22.2% step

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part Three: Pressure Flaking

ATTRIBUTE	AB9-5(b) Minimal Pressure Thin	AB13-15 Minimal Pressure Shape With P.F.
1.1 Scar Size	mostly minimal 67%	minimal 100%
2.1 Edge Sharp.	sharp 100%	sharp 100%
2.2 Margin Damage	absent 83% light 17% heavy = 0 (on failed scars only)	absent 81.25% light 18.75% heavy = 0
2.3 Microflakes	0	0
2.4 Prox. Edge Morph.	U-shaped notch 100%	U-shaped notch 100%
3.1 Percussion Bulb	indistinct 100%	0
3.2 Transition Angle	gradual rise 100%	0
3.3 Flake Thickness	thin 100%	0
4.1 Ribs	present 25% absent 75%	0
4.2 Dist. Ribs	indistinct 100%	0
4.3 Spacing Ribs	relatively close together 100%	0
4.4 Tearing	0	0
5.1 Scar Shape Distal Edge	58.3% straight 41.7% irregular	50% straight 50% irregular
5.2 Scar Termination	41.6% feather 58.4% step	88% feather 12% step

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part Three: Pressure Flaking

ATTRIBUTE	AB6-13(a) Minimum Shear Shape With Pressure Flaker	AB6-13(b) Moderate to Substantial Shear Shaping With P.F.
1.1 Scar Size	very minimal 100%	very minimal 55.5% minimal 44.5%
2.1 Edge Sharp.	intermediate 66.7% sharp edge 33.3%	predominantly sharp edge 100%
2.2 Margin Damage	absent 83.3% light 16.7% heavy = 0	heavy 100%
2.3 Microflakes	absent 33.3% heavy 66.7% light = 0	heavy 100%
2.4 Prox. Edge Morph.	straight 100% (also follows original edge)	follows existing edge straight 100%
3.1 Percussion Bulb	0	0
3.2 Transition Angle	0	0
3.3 Flake Thickness	0	0
4.1 Ribs	0	0
4.2 Dist. Ribs	0	0
4.3 Spacing Ribs	0	0
4.4 Tearing	0	0
5.1 Scar Shape Distal Edge	50% straight 50% irregular	44% straight 56% irregular
5.2 Scar Termination	100% feather	feather 77.7% step 22.3%

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part Four: Edge Units

ATTRIBUTE	AB2-2(a) Minimum Rub Abrade With Hammerstone	AB10-1(a) Minimal Rub Buffet With Hammerstone
1.1 Scar Size	almost no flake removals - grinding only	very minimal 100%
2.1 Edge Sharp.	dull edge 100%	intermediate sharpness 100%
2.2 Margin Damage	no damage but extensive grinding 100% 0	heavy 100%
2.3 Microflakes	0	0
2.4 Prox. Edge Morph.	follows existing edge of preform - straight 100%	convex projections and follows existing edge of preform - straight 100%
3.1 Percussion Bulb	0	0
3.2 Transition Angle	0	0
3.3 Flake Thickness	0	0
4.1 Ribs	0	0
4.2 Dist. Ribs	0	0
4.3 Spacing Ribs	0	0
4.4 Tearing	0	0
5.1 Scar Shape Distal Edge	a few extremely small rounded scars 100%	50% straight 25% rounded 25% irregular
5.2 Scar Termination	feather 100%	50% feather 50% step

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part Four: Edge Units

ATTRIBUTE	AB10-1(b) Minimal Rub Buffet With Antler Billet	AB2-2(b) Minimum Pressure Rub With P.F.
1.1 Scar Size	very minimal 100%	minimal 100%
2.1 Edge Sharp.	intermediate 15%	sharp edge 100%
2.2 Margin Damage	absent 85% light 15% heavy = 0	heavy 100%
2.3 Microflakes	absent 85% light 15% heavy = 0	heavy 100%
2.4 Prox. Edge Morph.	follows existing edge of preform - straight	84% straight with small distinct covnex projections 16% U-shaped notches
3.1 Percussion Bulb	absent 85% indistinct 15% distinct = 0	indistinct 100%
3.2 Transition Angle	absent 85% gradual rise 15% steep rise = 0	gradual 100%
3.3 Flake Thickness	thin 100% (less than 1 mm)	thin 100%
4.1 Ribs	0	0
4.2 Dist. Ribs	0	0
4.3 Spacing Ribs	0	0
4.4 Tearing	0	0
5.1 Scar Shape Distal Edge	100% irregular	50% straight 50% rounded
5.2 Scar Termination	92% feather 8% step	50% feather 50% step

Table 17 continued.

Definitive Morpho-Patterns for Behavior Units Based on Analysis of Experimental Specimens - Part Four: Edge Units

ATTRIBUTE	AB2-2(c) Min. Platform Isolating With Pressure Rub Using P.F.
1.1 Scar Size	very minimal 57.14% minimal 42.85%
2.1 Edge Sharp.	sharp 100%
2.2 Margin Damage	absent 14.28% heavy 85.72%
2.3 Microflakes	absent 57.15% light 42.85% heavy = 0
2.4 Prox. Edge Morph.	U-shaped notch 86% straight 14%
3.1 Percussion Bulb	indistinct 100%
3.2 Transition Angle	gradual rise 100%
3.3 Flake Thickness	thin 100%
4.1 Ribs	0
4.2 Dist. Ribs	0
4.3 Spacing Ribs	0
4.4 Tearing	absent 85.72% light 14.28% heavy = 0
5.1 Scar Shape Distal Edge	71% straight 15% rounded 14% irregular
5.2 Scar Termination	29% feather 71% step

Table 18: Form for Coding and Interpreting Prehistoric Artifacts
C01073 - Jordan Site

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: DeHa-8 - Jordan Site

1.3 Specimen Catalogue #: C01073

1.4 Photographic Plate Identification: special negatives

1.5 Standard Artifact Description:

1.6 Raw Material: welded tuff

1.7 Shape/Artifact Class: ovoid biface

1.8 Flaking (Bifacial/Unifacial): bifacial

1.9 Metric Size:
length - 27.5 cm
width - 10.4 cm
thickness - 1.5 cm

1.10 Form/Morphology Description:

This is a very large biface (i.e., 27.5 cm long) while at the same time being quite thin (1.5 cm) for its length and width. It has large spatulate thinning flakes on the main body with extensive secondary thinning flakes along the lateral margins. The specimen was broken bilaterally when collected and has subsequently been glued back together for analysis. The base of the specimen tapers to a straight and clean bedding plane fracture which was present at the time of manufacture as it has been used as a platform for retouch flakes.

Please Note

1. On many of the analysis forms (i.e., page 215 following) some edge attributes for the main flake scar are missing. These are not coded, as the original scar edge has been altered by subsequent edge treatment and is coded in the next column under 'Edge Treatment on Same Scar.' Edge treatments, although coded on one form, cover more than one scar as explained in the note column.
2. Diagrams illustrating the individual flake scars and edge units analyzed are placed at the end of the table (Figure 13 on page 265 and Figure 14 on page 266).
3. After examining the first few examples, the reader may wish to turn to the summary section (2.4) on page 257 of the table.

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # 01	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	minimal see note 1	1. Edge Unit 1 (a) is composed on minimum to moderate sized thinning flakes 2. Edge Unit 1 (b) consists of a very minimal effect applied over the 1 (a) unit along the edge of the flake scars. Unit 1 (a) is coded on this flake scar sheet. Unit 1 (a) covers the larger minimal sized flake scars 1 to 24 and 36-46 on the obverse face and scars 1 to 14 and 33-40 on the reverse face.
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		n/a see note 2	
2.3	Microflakes		n/a see note 2	
2.4	Proximal Edge Morphology		n/a see note 2	
3.1	Negative Bulb of Force	distinct	indistinct	
3.2	Bulb to Scar Transition Angle	gradual	gradual	
3.3	Flake Thickness	thin	thin	
4.1	Presence or Absence of Ribs	present	present	
4.2	Distinctiveness of Ribs	indistinct	indistinct	
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.	rel. close together (not poss. to code dist.)	
4.4	Tearing	0	0	
5.1	Scar Shape at Distal Edge	irregular	straight/ rounded	
5.2	Scar Termination at Distal Edge	feather	pred. step, some feather	

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 01, C01073

	Prehistoric C01073 Scar 01	AB11-11 Sub. Indirect Percussion	AB16-7(a) Sub./Mod. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB9-5 Mod. Perc. Thin Billet	AB3-17 Mod. Perc. Shape Hammerstone
1.1	moderate*	+ 1	+ 1	+ 1	+ 1	+ 1
2.1						
2.2						
2.3						
2.4						
3.1	distinct	+ 33.3 - 66.7	+ 1	+ 25 - 75	+ 80 - 20	+ 1
3.2	gradual	+ 1	+ 1	+ 75 - 25	+ 80 - 20	+ 1
3.3	thin	+ 1	+ 80 - 20	+ 50 - 50	+ 80 - 20	+ 1
4.1	present	+ 33.3 - 66.7	+ 80 - 20	+ 50 - 50	+ 20 - 80	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
4.3	rel. far apart & evenly dist.	+ 1	+ 1	- 1	- 1	+ 1
4.4	0	+ 66.7 - 33.3	+ 60 - 40	+ 75 - 25	+ 80 - 20	+ 66.7 - 33.3

Table 18 continued.

5.1	irregular	+ 66.7 - 33.3	- 1	+ 50 - 50	- 1	- 1
5.2	feather	+ 1	+ 40 - 60	+ 25 - 75	+ 50 - 50	+ 33.3 - 66.7
Total	+	+ 8.0	+ 7.60	+ 5.50	+ 5.90	+ 7.33
	-	- 2.0	- 2.40	- 4.50	- 4.10	- 2.67
%	+	+ 80	+ 76	+ 55	+ 59	+ 73
	-	- 20	- 24	- 45	- 41	- 27
Score		+ 60	+ 52	+ 10	+ 18	+ 46

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

* Although the scar size is moderate relative to this specimen, compared to other artifacts, it is substantial; therefore, some substantial comparisons are made (i.e., AB11-11 Sub. Indirect Percussion). All are coded + 1 for size.

* Possible + 60 Sub. Indirect Percussion (based on the size of the scar).

Please Note

The above scoring system is derived from comparing the attribute coding in section 2.0 of Table 18 with the coding of the appropriate experimental artifact in Table 17. A perfect match is scored + 1, a perfect mismatch - 1, partial scores are also possible as explained on page 196.

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar C01073 Edge Unit 1 (a) - Minimal Series of Scars (Coded Scar 01)

	Prehistoric C01073 Edge Unit 1(a)	AB16-7(b) Min. Perc. Thin Hammerstone	AB9-5(a) Mod. Press. Thin with P.F.	AB9-5(b) Min. Press. Thin	AB8-6 Sub. Press. Thin with P.F.	AB9-5(a) Min. Perc. Thin Billet
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 1	+ 1
2.2	n/a	n/a	n/a	n/a	n/a	n/a
2.3	n/a	n/a	n/a	n/a	n/a	n/a
2.4	n/a	n/a	n/a	n/a	n/a	n/a
3.1	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
3.2	gradual	+ 1	+ 1	+ 1	+ 1	+ 1
3.3	thin	+ 1	+ 1	+ 1	+ 1	+ 88.9 - 11.1
4.1	present	- 1	+ 22.2 - 77.8	+ 25 - 75	+ 50 - 50	- 1
4.2	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
4.3	rel. close together	- 1	+ 1	+ 1	+ 1	- 1
4.4	0	+ 1	+ 1	+ 1	+ 75 - 25	+ 88.9 - 11.1

Table 18 continued.

5.1	straight/ rounded	+ 1	+ 66.7 - 33.3	+ 58.3 - 41.7	+ 50 - 50	+ 56 - 44
5.2	pred. step, some feather	+ 50 - 50	+ 50 - 50	+ 1	+ 50 - 50	+ 50 - 50
Total	+	+ 8.5	+ 9.39	+ 9.83	+ 9.25	+ 7.84
	-	- 2.5	- 1.61	- 1.17	- 1.75	- 3.16
%	+	+ 77	+ 85	+ 89	+ 84	+ 71
	-	- 23	- 15	- 11	- 16	- 29
Score		+ 54	+ 70	+ 78	+ 68	+ 42

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 78 Min. Press. Thin with P.F.
Highly Probable + 70 Mod. Press. Thin with P.F.
Highly Probable + 68 Sub. Press. Thin with P.F.

Identify as Min. to Sub. Pressure thin with pressure flaker.

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # 07	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	very minimal see note 1	1. Unit 1(a) was coded on scar 01, this scar sheet contains coding for edge unit 1(b) (see scar 01).
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		0	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		irregular/ straight convex projections	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular	small rounded some straight	
5.2	Scar Termination at Distal Edge	pred. feather (part step)	mostly step some feather	

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 07, C01073

	Prehistoric C01073 Scar 07	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	+ 1	+ 1	- 1
4.4	light	+ 25 - 75	+ 33.3 - 66.7	+ 40 - 60

Table 18 continued.

5.1	irregular	+ 50 - 50	+ 66.7 - 33.3	- 1
5.2	pred. feather some step	+ 50 - 50	+ 1	+ 50 - 50
Total	+	+ 6.75	+ 8.0	+ 6.5
	-	- 3.25	- 2.0	- 3.5
%	+	+ 68	+ 80	+ 65
	-	- 32	- 20	- 35
Score		+ 36	+ 60	+ 30

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 60 Sub. Indirect Percussion

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar C01073, Edge Unit 1(b) (Coded on Scar 07)

	Prehistoric C01073 Edge Unit 1(b)	AB2-2(b) Min. Press. Rub with P.F.	AB6-13(a) Min. Shear Shape with P.F.	AB6-13(b) Mod. Shear Shape P.F.	AB10-1(b) Min. Rub Buffet Billet	AB16-7(b) Min. Perc. Thin Hammerstone
1.1	very minimal	+ 1	+ 1	+ 1	+ 1	- 1
2.1	sharp	+ 1	+ 33.3 - 66.7	+ 1	- 1	+ 1
2.2	0	- 1	+ 83.3 - 16.7	- 1	+ 85 - 15	+ 44 - 66
2.3	heavy	+ 1	+ 66.7 - 33.3	+ 1	- 1	+ 50 - 50
2.4	irreg./straight convex project.	+ 84 - 16	+ 1	+ 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

Table 18 continued.

5.1	small rounded some straight	+ 1	+ 50 - 50	+ 44 - 56	- 1	+ 50 - 50
5.2	mostly step some feather	+ 50 - 50	+ 20 - 80	+ 22.3 - 77.7	- 1	+ 20 - 80
Total	+	+ 5.34	+ 4.53	+ 4.66	+ 2.85	+ 3.64
	-	- 1.66	- 2.47	- 2.34	- 4.15	- 3.36
%	+	+ 76	+ 65	+ 67	+ 41	+ 52
	-	- 24	- 35	- 33	- 59	- 48
Score		+ 52	+ 30	+ 34	- 18	+ 4

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 52 Min. Pressure Rub with P.F.

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # 022	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very substantial	1	1. See scars 01 and 07 for edge units 1(a) and 1(b).
2.1	Edge Sharpness			
2.2	Margin Damage			2. Not possible to code due to natural undulations and bedding planes in the raw lithic material
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	n/a 2		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather step		

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 022, C01073

	Prehistoric C01073 Scar 022	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.
1.1	very sub.	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1
4.1	present	+ 80 - 20	+ 50 - 50	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 60 - 40	+ 75 - 25	+ 66.7 - 33.3

Table 18 continued.

5.1	irregular	- 1	+ 50 - 50	+ 66.7 - 33.3
5.2	feather step	+ 1	+ 1	+ 1
Total	+	+ 7.20	+ 6.75	- 7.33
	-	- 1.80	- 2.25	- 1.67
%	+	+ 80	+ 75	+ 81
	-	- 20	- 25	- 19
Score		+ 60	+ 50	+ 62

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

+ 62 - Sub. Indirect Perc.

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # 030	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	minimal 1	1. Edge Unit 2 scars 25-35 obverse face and scars 15-32 reverse face.
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		light	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		irregular/ straight with convex projections	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thick (2.5 mm)		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	heavy		
5.1	Scar Shape at Distal Edge	irregular	small rounded some straight	
5.2	Scar Termination at Distal Edge	predominantly step, some feather	mostly step some feather	

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 030, C01073

	Prehistoric C01073 030	AB16-7(a) Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thick	+ 20 - 80	+ 50 - 50	- 1
4.1	present	+ 80 - 20	+ 66.7 - 33.3	+ 33.3 - 66.6
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	- 1	+ 1	+ 1
4.4	heavy	- 1	- 1	- 1

Table 18 continued.

5.1	irregular	- 1	+ 50 - 50	+ 66.7 - 33.3
5.2	pred. step some feather	+ 1	+ 1	+ 20 - 80
Total	+	+ 6.0	+ 7.0	+ 5.87
	-	- 4.0	- 3.0	- 4.13
%	+	+ 60	+ 70	+ 59
	-	- 40	- 30	- 41
Score		+ 20	+ 40	+ 18

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 40 Sub. Perc. Thin Billet

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 030, C01073, Edge Unit # 2

	Prehistoric C01073 Edge Unit 2	AB9-5 Min. Perc. Thin Billet	AB2-2 Min. Press. Rub with P.F.	AB16-7(b) Min. Perc. Thin Hammerstone	AB6-13(a) Min. Shear Shape P.F.	AB6-13(b) Mod. Shear Shape P.F.
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 33.7 - 66.7	+ 1
2.2	light	- 1	- 1	- 1	+ 16.7 - 83.3	- 1
2.3	heavy	+ 1	+ 1	+ 50 - 50	+ 66.7 - 33.3	+ 1
2.4	irreg./straight convex project.	+ 1	+ 84 - 16	+ 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

Table 18 continued.

5.1	small rounded some straight	+ 56 - 44	+ 1	+ 1	+ 50 - 50	+ 50 - 50
5.2	pred. step some feather	+ 1	+ 1	+ 20 - 80	+ 20 - 80	+ 20 - 80
Total	+	+ 5.56	+ 5.84	+ 4.7	+ 3.87	+ 4.7
	-	- 1.44	- 1.16	- 2.3	- 3.13	- 2.3
%	+	+ 79	+ 83	+ 67	+ 55	+ 67
	-	- 21	- 17	- 33	- 45	- 33
Score		+ 58	+ 66	+ 34	+ 10	+ 34

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 66 - Min. Press. Rub with P.F.

25

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # 037	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	1	1. See scars 01 and 07 for edge units 1(a) and 1(b).
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	mostly feather some step		

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 037, C01073

	Prehistoric C01073 Scar 037	AB8-6 Sub. Press. Thin with P.F.	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet
1.1	moderate	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 1	+ 80 - 20
3.2	gradual	+ 1	+ 1	+ 80 - 20
3.3	thin	+ 1	+ 80 - 20	+ 80 - 20
4.1	present	+ 50 - 50	+ 80 - 20	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	- 1	- 1	+ 1
4.4	light	+ 25 - 75	+ 40 - 60	+ 20 - 80

Table 18 continued.

5.1	irregular	- 1	- 1	- 1
5.2	mostly feather some step	+ 1	+ 50 - 50	+ 1
Total	+	+ 6.75	+ 6.5	+ 7.40
	-	- 3.25	+ 3.5	- 2.60
%	+	+ 67	+ 65	+ 74
	-	- 33	- 35	- 26
Score		+ 34	+ 30	+ 48

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 48 - Mod. Percussion Thin Billet

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # 042	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	1	1. See scars 01 and 07 for edge units 1(a) and 1(b).
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology	flat curved notch		
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather		

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 042, C01073

	Prehistoric C01073 Scar 042	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.	AB16-7 Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4	flat curved notch	+ 1	+ 1	+ 1
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	+ 1	+ 1	- 1
4.4	light	+ 25 - 75	+ 33.3 - 66.7	+ 40 - 60

Table 18 continued.

5.1	irregular	+ 50 - 50	+ 66.7 - 33.3	- 1
5.2	feather	+ 25 - 75	+ 1	+ 40 - 60
Total	+	+ 7	+ 9	+ 7.4
	-	- 3	- 2	- 3.6
%	+	+ 68	+ 82	+ 67
	-	- 32	- 18	- 33
Score		+ 35	+ 64	+ 34

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 64 - Sub. Indirect Perc.

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # R3	Edge Treatment on Same Scar	Notes
1.1	Scar Size	minimal	1	1. See scars 01 and 07 for edge units 1(a) and 1(b).
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. close together & evenly dist.		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight/ rounded		
5.2	Scar Termination at Distal Edge	feather/ step		

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R3, C01073

	Prehistoric C01073 Scar R3	AB3-17 Min. Perc. Shape Hammerstone	AB5-9(a) Min. Perc. Thin Billet	AB9-5(a) Mod. Press. Thin P.F.	AB9-5(b) Min. Press. Thin P.F.
1.1	minimal	+ 1	+ 1	+ 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 1	+ 1	+ 1	+ 1
3.2	gradual	+ 1	+ 1	+ 1	+ 1
3.3	thin	+ 1	+ 88.9 - 11.1	+ 1	+ 1
4.1	present	+ 33.3 - 66.7	- 1	+ 22.2 - 77.8	+ 25 - 75
4.2	indistinct	+ 1	n/a	+ 1	+ 1
4.3	rel. close together evenly dist.	- 1	n/a	+ 1	+ 1
4.4	0	+ 66.7 - 33.3	+ 88.9 - 11.1	+ 1	+ 1

Table 18 continued.

5.1	straight/ rounded	+ 50 - 50	+ 56 - 44	+ 66.7 - 33.3	+ 58.3 - 41.7
5.2	feather/ step	+ 1	+ 1	+ 1	+ 1
Total	+	+ 7.5	+ 6.34	+ 8.89	+ 8.83
	-	- 2.5	- 1.66	- 1.11	- 1.17
%	+	+ 75	+ 79	+ 89	+ 88
	-	- 25	- 21	- 11	- 12
Score		+ 50	+ 58	+ 78	+ 76

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 78 Mod. Press. Thin P.F.
Highly Probable + 76 Min. Press. Thin P.F.

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # R11	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial		See Scars 01 and 07 for edge units 1(a) and 1(b).
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and & evenly dist.		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather (some step)		

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R11, C01073

	Prehistoric C01073 Scar R11*
1.1	substantial
2.1	
2.2	
2.3	
2.4	
3.1	indistinct
3.2	gradual
3.3	thin
4.1	present
4.2	indistinct
4.3	rel. far apart evenly dist.
4.4	light

Table 18 continued.

5.1	irregular
5.2	feather
Total	+
	-
%	+
	-
Score	

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

* Identical morphology to scar 07 - see that coding sheet for identification of this scar.

Possible + 60 Substantial Indirect Percussion

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # R18	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very sub.	1	1. See scar 030 for edge unit 2.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather		

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R18, C01073

	Prehistoric C01073 R18	AB11-11 Sub. Indirect Percussion	AB7-10 Sub. Perc. Thin Billet	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	very sub.	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 66.7 - 33.3	+ 75 - 25	+ 1
3.2	gradual	+ 1	+ 15 - 25	+ 1
3.3	thin	+ 1	+ 50 - 50	+ 80 - 20
4.1	present	+ 33.3 - 66.7	+ 50 - 50	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart evenly dist.	+ 1	- 1	+ 1
4.4	0	+ 66.7 - 33.3	+ 75 - 25	+ 60 - 40

Table 18 continued.

5.1	irregular	+ 66.7 - 33.3	+ 50 - 50	- 1
5.2	feather	+ 1	+ 50 - 50	+ 40 - 60
Total	+	+ 8.33	+ 6.25	+ 7.6
	-	- 1.67	- 3.75	- 2.4
%	+	+ 83	+ 63	+ 76
	-	- 17	- 37	- 24
Score		+ 66	+ 26	+ 52

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 66 Sub. Indirect Perucssion

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # R19, R20, R21	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate 2	1	1. See scar 030 for edge unit #2.
2.1	Edge Sharpness			2. The next three scars, R19, R20, R21, appear to be caused by the same production unit according to a judgmental evaluation of the morphological attribution in the specimen.
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	step		

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R19, R20, R21, C01073*

	Prehistoric C01073 Scars R19-21	AB5-9(b) Mod. Perc. Thin Billet	AB9-5(a) Mod. Press. Thin with P.F.	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB11-11 Sub. Indirect Percussion
1.1	moderate	+ 1	+ 1	+ 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 80 - 20	+ 1	+ 1	+ 66.7 - 33.3
3.2	steep	+ 20 - 80	- 1	- 1	- 1
3.3	thin	+ 80 - 20	+ 1	+ 1	+ 1
4.1	present	+ 80 - 20	+ 22.2 - 77.8	+ 80 - 20	+ 33.3 - 66.6
4.2	indistinct	+ 1	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	+ 1	- 1	- 1	+ 1
4.4	light	+ 20 - 80	- 1	+ 40 - 60	+ 33.3 - 66.6

Table 18 continued.

5.1	pred. straight some rounded	+ 1	+ 66.7 - 33.3	+ 1	+ 33.3 - 66.6
5.2	pred. step some feather	+ 1	+ 20 - 80	+ 1	+ 50 - 50
Total	+	+ 8.4	+ 5.1	+ 7.2	+ 6.16
	-	- 1.6	- 4.9	- 2.8	- 3.84
%	+	+ 84	+ 51	+ 72	+ 62
	-	- 16	- 49	- 28	- 38
Score		+ 68	+ 2	+ 44	+ 24

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 68 Mod. Perc. Thin Billet

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # R30	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very sub.	1	1. See scar 030 for edge unit #2.
2.1	Edge Sharpness			2. These subs are quite a distance apart.
2.2	Margin Damage			
2.3	Microflakes			3. The step termination took place along a natural flaw or fault line in the raw material.
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thick (.3 mm)		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart & evenly dist. 2		
4.4	Tearing	heavy		
5.1	Scar Shape at Distal Edge	n/a 3		
5.2	Scar Termination at Distal Edge	n/a 3		

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R30, C01073

	Prehistoric C01073 R30	AB16-17 Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.
1.1	very sub.	- 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thick	+ 20 - 80	+ 50 - 50	- 1
4.1	present	+ 80 - 20	+ 50 - 50	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	- 1	+ 1	+ 1
4.4	heavy	- 1	- 1	- 1

Table 18 continued.

5.1		n/a	n/a	n/a	n/a
5.2		n/a	n/a	n/a	n/a
Total	+		+ 4	+ 5.5	+ 5
	-		- 4	- 25	- 3
%	+		+ 50	+ 68	+ 63
	-		- 50	- 32	- 37
Score			0	+ 36	+ 26

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Cannot identify - the indirect percussion score was lowered by attribute 3.3 (scar thickness), therefore, this scar may be a failed indirect percussion scar in that too much material was removed resulting in the hinge fracture.

Table 18 continued.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01073	Main Flake Scar # R32	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	1	1. See scar 030 for edge unit #2.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	distinct		
3.2	Bulb to Scar Transition Angle	steep		
3.3	Flake Thickness	thick		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on distal 1/2		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather/ step		

Table 18 continued.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R28, C01073

	Prehistoric C01073 R28*	AB11-11 Sub. Indirect Perc.	AB7-10 Sub. Perc. Thin Billet	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	distinct	+ 33.3 - 66.7	+ 25 - 75	- 1
3.2	steep	- 1	+ 25 - 75	- 1
3.3	thick	- 1	+ 50 - 50	+ 20 - 80
4.1	present	+ 33.3 - 66.7	+ 50 - 50	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	+ 1	+ 1	- 1
4.4	light	+ 33.3 - 66.7	+ 25 - 75	+ 40 - 60

Table 18 continued.

5.1		rounded	+ 33.3 - 66.7	+ 50 - 50	+ 40 - 60
5.2		feather and step	+ 50 - 50	+ 1	+ 1
Total	+		+ 4.8	+ 6.25	+ 4.8
	-		- 5.2	- 3.75	- 5.2
%	+		+ 48	+ 62	+ 48
	-		- 52	- 33	- 52
Score			- 4	+ 29	- 4

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 29 Sub. Perc. Thin Billet

Table 18 continued.

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact C01073 (Jordan) - Page 1

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
01		Possible	+ 60	Sub. Indirect Percussion Thin	AB11-11
	Edge Unit 1(a)	Highly Probable	+ 78	Min. to Sub. Pressure Thin with Pressure Flaker	AB9-5(b) AB9-5(a) AB8-6
07		Possible	+ 60	Sub. Indirect Percussion Thin	AB11-11
	Edge Unit 1(b)	Possible	+ 52	Min. Pressure Rub with P.F.	AB2-2(b)
022		Possible	+ 62	Sub. Indirect Perc. Thin	AB11-11
030		Possible	+ 40	Sub. Perc. Thin Billet	AB7-10
	Edge Unit # 2	Possible	+ 66	Min. Pressure Rub with P.F.	AB2-2(b)
037		Possible	+ 50	Mod. Perc. Thin Billet	AB5-9(a)
042		Possible	+ 64	Sub. Indirect Perc.	AB11-11

Table 18 continued.

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact C01073 (Jordan) - Page 2

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
R3		Highly Probable Highly Probable	+ 78 + 76	Moderate Pressure Thin P.F. Minimal Pressure Thin P.F.	AB9-5(a) AB9-5(b)
R11		Possible	+ 60	Sub. Indirect Percussion	AB11-11
R18		Possible	+ 66	Sub. Indirect Percussion	
R19 R20 R21		Probable	+ 68	Moderate Perc. Thin Billet	AB5-9(b)
R30		n/a	n/a	difficult to identify - may be a failed indirect percussion scar	n/a
R32		Possible	+ 29	Sub. Percussion Thin Billet	AB7-10

Table 18 continued.

3.0 Interpretation of Behavior (Technological) Units: C01073

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Substantial Indirect Percussion Thinning: This behavior unit dominates the prehistoric artifact with six flakes (01, 07, 022, 04, R11, R18) identified. Indirect percussion involves placing one end of a billet on a platform, then hitting it with a second billet. In morphology it lies between billet and pressure flaking and produces generally, extremely large, thin spatulate flakes with irregular feather terminations. Production Unit Code is 40:5, 51, 51. This unit was used for primary face paring.

(b) Moderate/Substantial Percussion Thin with Billet: Identified on four scars (030, 037, R19, R20, R32), this unit was used for secondary face paring and margin contouring by increasing the edge angle. Production Unit Code is 31/40:4, 41, 41.

3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

There are minimal, moderate and substantial pressure thinning units present on the specimen [identified from scar R3 and many scars in edge unit 1(a) (scored together)]. Pressure is a type of force produced when the tip of a tool (i.e., antler) is placed on the edge of the artifact and pushed inwards and/or downwards. It is used here for secondary thinning and margin regularizing (removal of inter-scar ridges). Production Unit Code 30/40:3/4, 31, 31.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

(a) Edge Unit 1(a): Because of the extreme size of the specimen, one of the edge units 1(a) actually consists of the pressure flaking outlined above. The pressure flaking is not universal and is confined primarily to the edge unit 1(a) area. This was used to thin the tip of the specimen.

(b) Edge Unit 1(b) and Edge Unit 2: These two edge units both have the same behavior unit, namely minimal pressure rub with a pressure flaker. This unit consists of using the tip of a pressure flaker to rub across the edge of an artifact which strengthens an overly thin edge by removing material to blunt the edge. Some minimal flakes are removed and the resulting edge is characteristically rough with numerous small convex projections and some U-shaped notches. Production Unit Code is 21:2, 13, 31.

Table 18 continued.

(b) Reconstructing Sequencing of Production Units: C01073

3.4 Flow Diagram of Production Units (below)

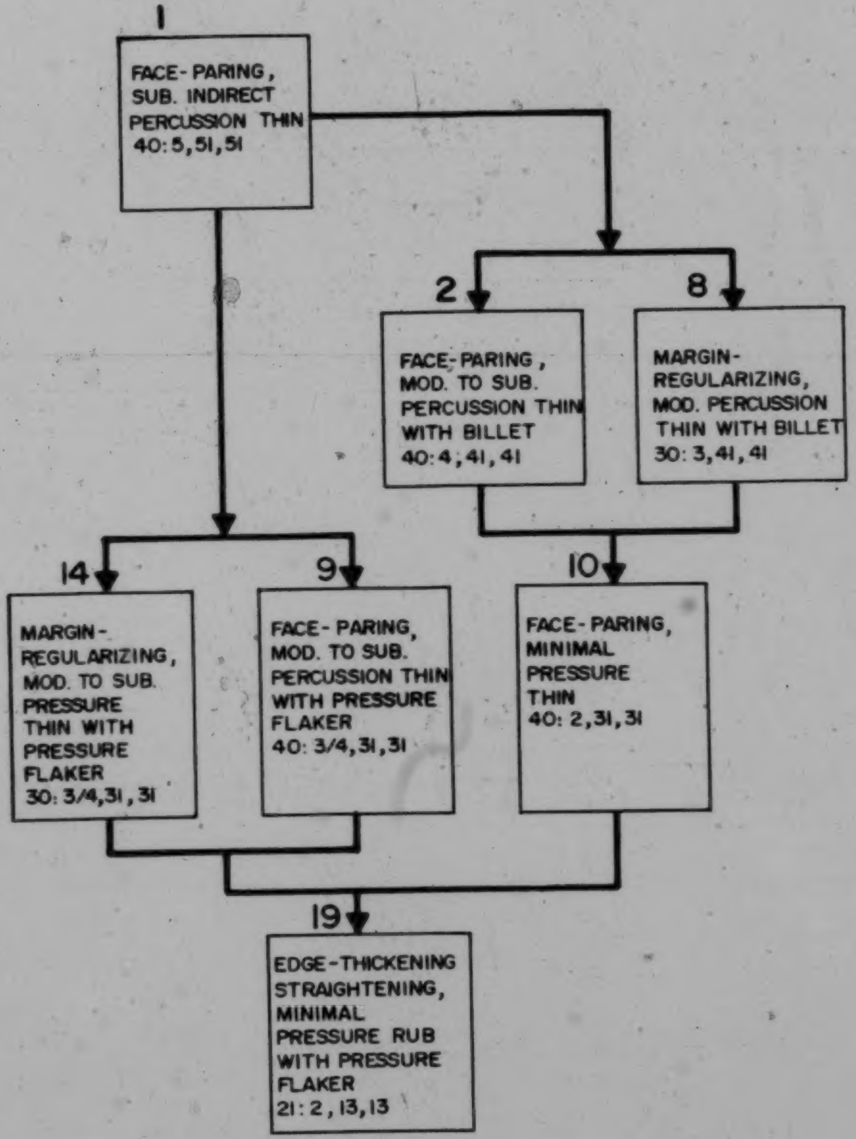

1
FACE-PARING, SUB. INDIRECT PERCUSSION THIN 40:5,51,51
2
FACE-PARING, MOD. TO SUB. PERCUSSION THIN WITH BILLET 40:4,41,41
8
MARGIN-REGULARIZING, MOD. PERCUSSION THIN WITH BILLET 30:3,41,41
14
MARGIN-REGULARIZING, MOD. TO SUB. PRESSURE THIN WITH PRESSURE FLAKER 30:3/4,31,31
9
FACE-PARING, MOD. TO SUB. PERCUSSION THIN WITH PRESSURE FLAKER 40:3/4,31,31
10
FACE-PARING, MINIMAL PRESSURE THIN 40:2,31,31
19
EDGE-THICKENING STRAIGHTENING, MINIMAL PRESSURE RUB WITH PRESSURE FLAKER 21:2,13,13

Table 18 continued.

3.5 Description and Discussion of Technological Grammar Found on Artifact

Consisting of an extremely large biface, this prehistoric artifact has long been a source of speculation and interest to the researcher after having first examined it in 1975. The "secret" of its manufacture, especially considering the width and thinness of the item, has long eluded any concrete analysis up to this point in time. However, as observable from the flow diagram of production units the technological basis for the specimen consists of only seven behavior units verifiable on the artifact. No doubt there may have been other units, especially shaping ones, earlier in the production process but these are no longer visible on the artifact faces and have been removed by subsequent thinning flakes. The major thinning unit identified from six scars is the very substantial indirect percussion thinning (face paring) which was used to thin the greater part of the item, especially the interior portions. This initial thinning was followed up by secondary thinning, namely substantial percussion thinning with a billet identified by four individual flake scar coding and scoring results. As well, since significant areas of the surface are not thinned by substantial indirect percussion, the billet units also served as a margin regularizing agent by removing the inter-scar ridges in some cases (i.e., scars 19-21).

Secondary units consist of Edge Units 1(a) and 1(b) and 2. Edge Unit 1(a) is considered as an edge unit due to the small size of the flakes in relation to the large size of the artifact. In fact, however, this unit contains a whole range of pressure thinning from substantial to minimal. The pressure flaking has been positively identified from an analysis of scar number 3 and many composite scars scored together under Edge Unit 1(a). The purpose of the pressure thinning is to thin areas not suitable for further hammerstone thinning due to the already thin nature of the specimen or in areas where one does not want to be forced to remove further margin material such as at the tip of the specimen (percussion flaking leaves shallow curved notches which require edge straightening). Depending on the amount of thinning desired, substantial, moderate or minimal force was used. The pressure flaking is restricted generally to the area identified as Edge Unit 1(a). As well as thinning, some removal of inter-scar ridges was accomplished by pressure flaking (see scars R9-12). The final step in preparing the specimen involves a minimal pressure rub with a pressure flaker. Virtually all edges of the artifact were treated (Edge Units 1(a) and 2). This behavior unit strengthens overly thin edges left by percussion flaking it, and to some extent helps to straighten out the edge by levelling somewhat, the flat curved notches and negative percussion bulb left from indirect and direct percussion flaking and also the U-shaped notches left by pressure flaking. Although the artifact is broken bilaterally this seems to be the result of post manufacturing trauma and not a flaw in the manufacturing strategy or flintknapper's skills.

As mentioned, the specimen is a large and unusual one not only for the boreal forest but for North America as a whole. It is not unwarranted to speculate that manufacture of such specimens is not possibe without the use of the indirect percussion technique. In fact, after examining this specimen, the late Francois Bordes told the writer that

Table 18 continued.

the skill exhibited in this specimen was in the top 30 percentile on a world wide basis (personal communication: Fraćois Bordes to John Pollock).

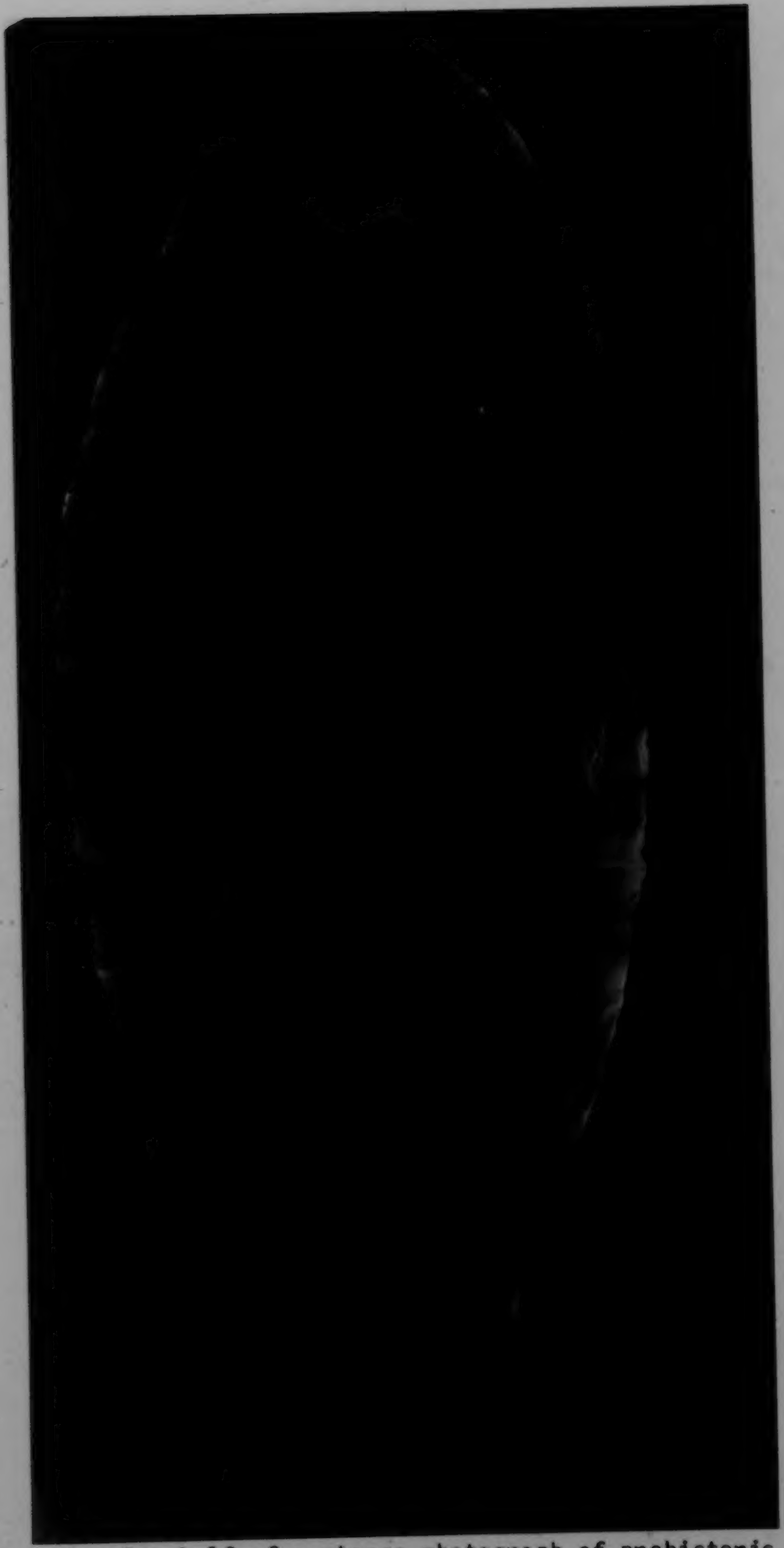


Plate 29. One half of a stereo photograph of prehistoric artifact C01073, obverse face.

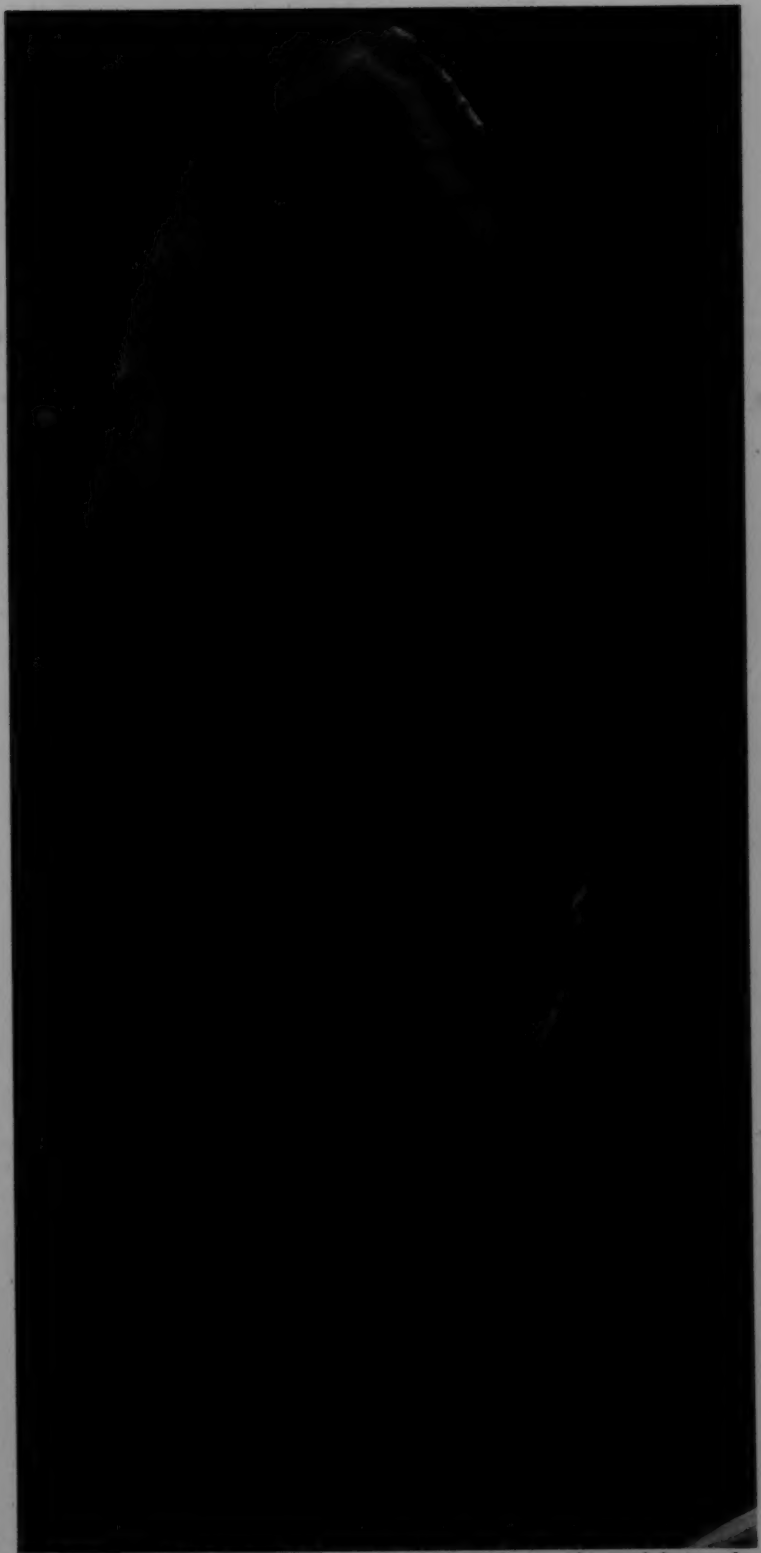


Plate 30. One half of a stereo photograph of prehistoric artifact C01073, reverse face.

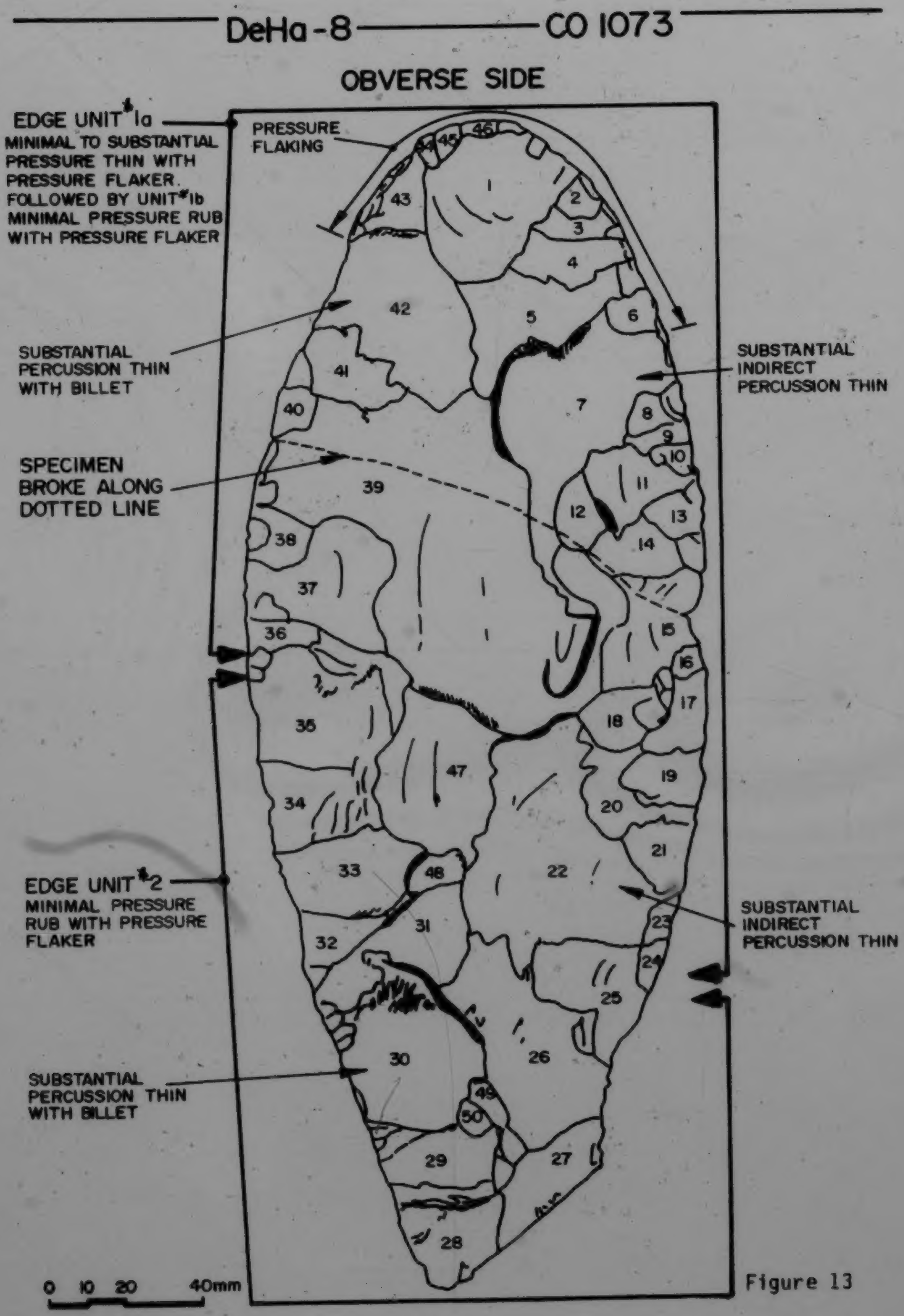

DeHa-8 — CO 1073
OBVERSE SIDE
EDGE UNIT #1a
MINIMAL TO SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER. FOLLOWED BY UNIT #1b MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
PRESSURE FLAKING
SUBSTANTIAL PERCUSSION THIN WITH BILLET
SUBSTANTIAL INDIRECT PERCUSSION THIN
SPECIMEN BROKE ALONG DOTTED LINE
EDGE UNIT #2
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
SUBSTANTIAL INDIRECT PERCUSSION THIN
SUBSTANTIAL PERCUSSION THIN WITH BILLET
0 10 20 40mm

Figure 13

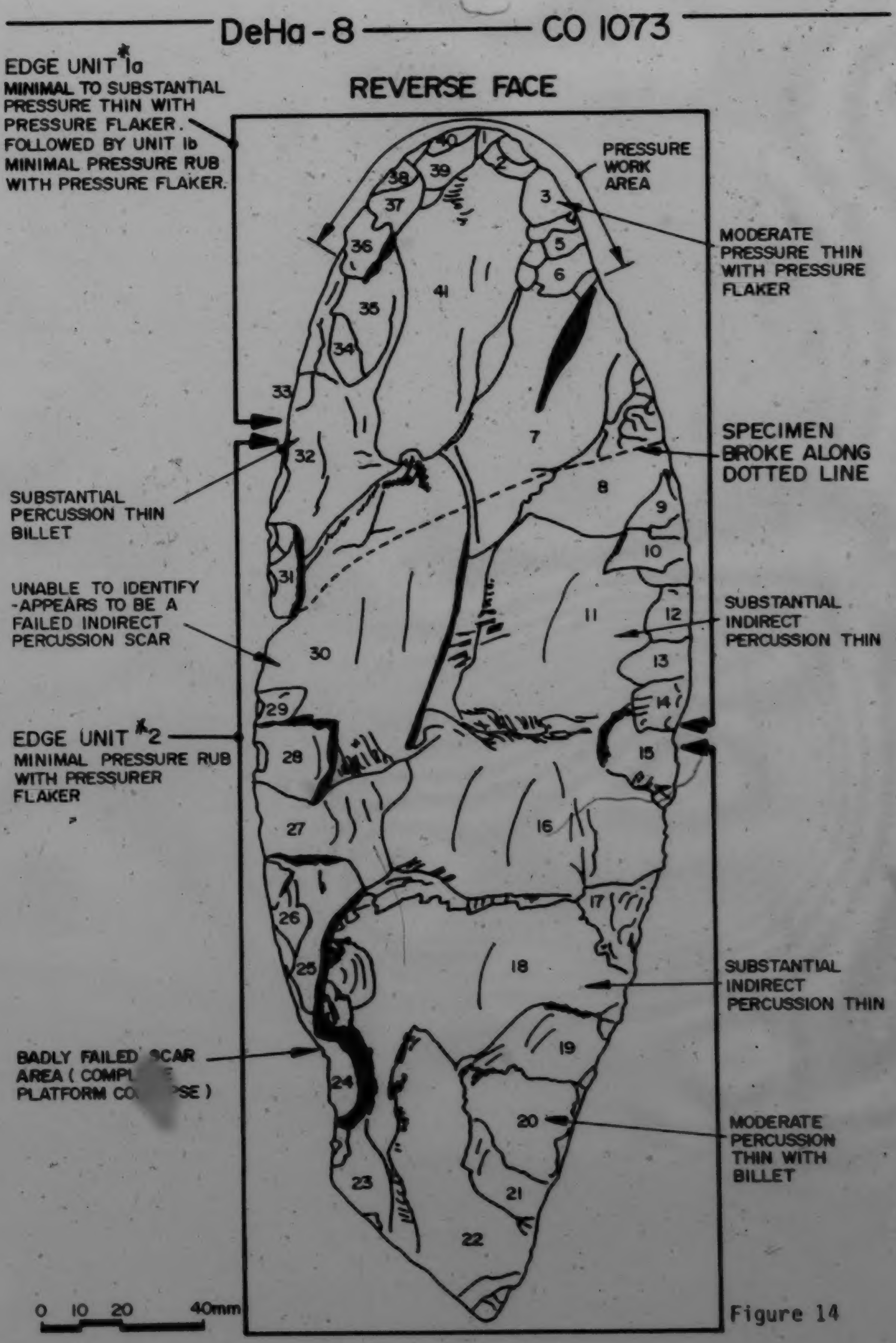

DeHa - 8 CO 1073
REVERSE FACE
EDGE UNIT *1a
MINIMAL TO SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER. FOLLOWED BY UNIT 1b MINIMAL PRESSURE RUB WITH PRESSURE FLAKER.
PRESSURE WORK AREA
MODERATE PRESSURE THIN WITH PRESSURE FLAKER
SPECIMEN BROKE ALONG DOTTED LINE
SUBSTANTIAL PERCUSSION THIN BILLET
UNABLE TO IDENTIFY -APPEARS TO BE A FAILED INDIRECT PERCUSSION SCAR
SUBSTANTIAL INDIRECT PERCUSSION THIN
EDGE UNIT *2
MINIMAL PRESSURE RUB WITH PRESSURER FLAKER
SUBSTANTIAL INDIRECT PERCUSSION THIN
BADLY FAILED SCAR AREA (COMPL[illegible] PLATFORM CO[illegible]PSE)
MODERATE PERCUSSION THIN WITH BILLET
0 10 20 40mm

Figure 14

Summary Comments

In addition to the one experimental specimen (AB8-6, substantial pressure thin with pressure flaker) and the one prehistoric biface (C01073) from the Jordan site which are utilized as examples in Volume I of the thesis, a further 13 experimental specimens, and 11 additional prehistoric artifacts were analyzed and are part of the appendices. A listing of these is presented in Table 19 for ready reference.

As noted, the vast majority of analysis data for both the experimental specimens and the prehistoric artifacts are contained in appendices forming Volume II of this thesis. Due to the sheer volume of this material, in some copies of the dissertation Volume II has been included as a microfiche located inside the back cover of Volume I.

Table 19: List of Experimental Specimens and Prehistoric Artifacts Analyzed in Appendices

(a) Experimental Specimens:

AB8-6 - used as an example (Table 14) in main thesis volume (Vol. I). All other experimental specimens, e.g., AB10-1 (a & b), AB2-2 (a, b, c,), AB9-5 (a, b), AB16-7 (a, b), AB5-9 (a, b), AB7-10, AB11-11, AB6-13 (a, b), AB13-15, AB14-16 (a, b), AB3-17, AB15-18 (a, b), AB12-19 - are contained in Appendix IV, Tables 35 to 57. The numbering system for the experimental artifacts was based on the letters AB for Abitibi, the first number represents the preform number in order of manufacture, and the second number represents the experiment number in the sequence they were conducted.

(b) Prehistoric Artifacts:

Artifact C01073 from the Jordan site - used as an example in the main thesis volume (Vol. I). All other prehistoric artifacts, e.g., C01083, C01085, C01079, C01067 and C01071 from the Jordan site, and C02169, C02357, C02135, C02082, C02070 and C02071 from the Jessup site are contained in Appendix V of the thesis. The catalogue numbers for each artifact are taken from numbers written on the artifact. The original master list of catalogue numbers for the site is on file at the Regional Parks office of the Ministry of Natural Resources in Cochrane, Ontario.

Part Five: Discussion and Comparative Analysis of the Prehistoric Artifacts

Introduction

The preceding prehistoric example analysis (Table 18) and the appendices contain the complete data base for analysis of the prehistoric specimens. These tables were designed to contain four levels of information leading to different levels of analysis. The four levels are as follows:

Level 1: Shape and Metric Descriptions (outline form and size in cm);
Level 2: Behavior Units (extent of effect, behavior type and tool used to remove flakes);
Level 3: Production units (adding function to behavior units); and,
Level 4: The sequence of production units used to manufacture each artifact (based on an examination of the flake scar sequences).

As noted in the introductory chapter, the major purpose of this thesis is to extend beyond traditional lithic analysis and explore a new theory and method of lithic research utilizing a cognitive analysis. It is suggested that this will allow for better resolution of archaeological research problems by creating the basis for a refined stone tool typology.

In order to demonstrate this potential, this part of the thesis has been divided into four levels or parts. Level one contains a more traditional shape/metric analysis. Level two consists of the identification of the specific behavior and production units used to manufacture the specimen. These behavior units (a unit = one flake scar) were identified by comparison to the experimental artifacts. The behavior behind each experimental flake scar morphology is known and documented, allowing for identification of similar scars (by comparing 14 key morphological attributes) on prehistoric specimens. Level three is arrived at when function is added to a behavior unit; it then becomes a production unit (see Table 11). Level four consists of the sequence of the production units used to manufacture the artifact. While the behavior units (such as percussion thinning with a hammerstone) are world wide in distribution, it is logical to consider that the sequence of production units used in manufacturing a particular specimen may be much more restricted. Due to the very nature of flintknapping skills (which require a lengthy apprenticeship and training period, plus learning of complex motor movements), production sequences may tend to be group specific. Studies of modern day flintknappers demonstrate that tools of the same material, size and shape can be produced by quite different sequences of the same production units (Young & Bonnichsen 1984).

Level One: Shape and Metric Descriptions

The twelve prehistoric artifacts from the Jordan and Jessup sites were sorted into three different categories as shown in Figure 15. Metric analysis of the same specimens are given in Table 20. Based on the shape and average metric measurements of these artifacts, the following conclusions can be made regarding the assemblage:

(1) The three lanceolate-shaped, convex-based specimens from the Jordan site (C01083, C01079, C01085) are essentially similar in form and size

to the three Jessup site specimens (C02169, C02070, C02071). The average size difference is negligible (less than 1 cm) between these groups, and the overlap in form is impressive as well.

(2) The large Jordan site bifaces (C01071, C01073) are unique and cannot be related to the others in terms of size from either site. They are over twice as large as any of the other specimens.

(3) The bi-pointed ovoid bifaces from the Jessup site (C02357, C02082, C02135) form a separate shape category from all others and are slightly longer, narrower and thicker than the convex-based lanceolate bifaces.

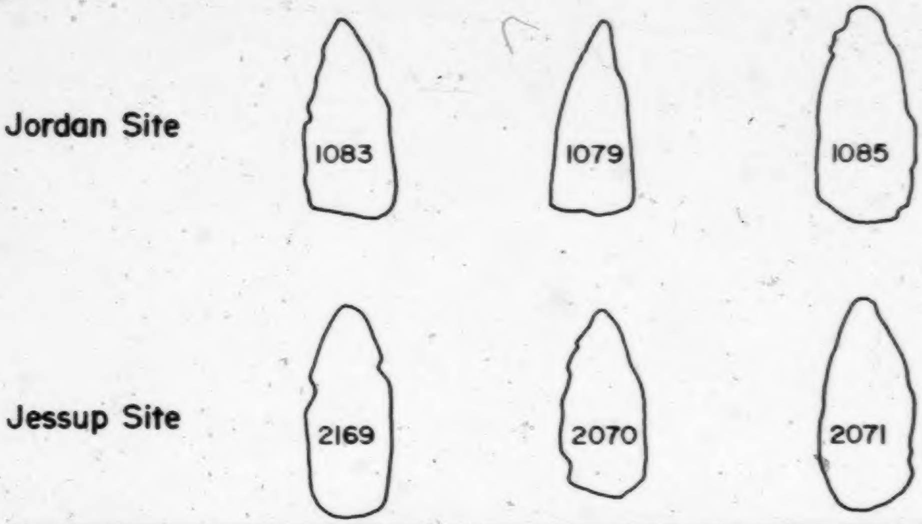
(4) One large Jordan biface (C01073), in terms of shape, is somewhat similar to shape group B, while the other (C01071) is most comparable, in terms of shape, to group A. The third, a semi-lunate biface (C01067) is in a unique shape category by itself.

From the above analysis only, it could be concluded that these assemblages, in terms of shape, are closely related due to the overlap in the convex based lanceolate bifaces. The bi-pointed ovoid ones, however, are unique to the Jessup site. The large bifaces could be placed in a category by themselves. As there is little shape or metric evidence to connect them to the rest of the assemblage, they could be the product of an earlier component, or be explained by stating they were traded in from elsewhere. It would be very difficult in terms of shape (one more closely resembles a bi-pointed form) and size (they are twice as large) to place them in the same component as the smaller bifaces at either site.

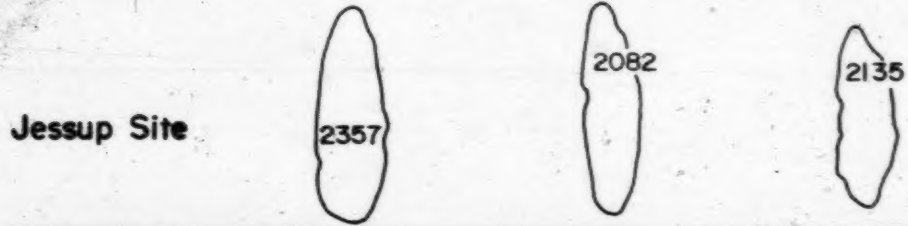
SHAPE ANALYSIS

JORDAN & JESSUP SITES

SHAPE GROUP A: CONVEX BASED - LANCEOLATE BIFACES


Jordan Site
1083
1079
1085
Jessup Site
2169
2070
2071

SHAPE GROUB B: BI-POINTED - OVOID BIFACES


Jessup Site
2357
2082
2135

SHAPE GROUP C: LARGE BIFACES - VARIOUS SHAPES

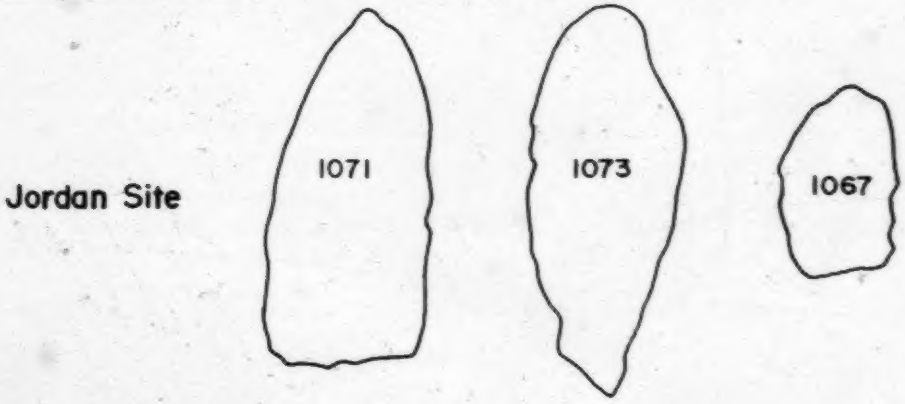

Jordan Site
1071
1073
1067

Figure 15

Table 20: Metric Analysis of the Three Shape Categories in Figure 15.

Site	Catalogue #	Length (cm)	Width) (cm)	Thickness (cm)
A. Convex based - lanceolate bifaces				
Jordan	C01083	10.3	4.8	1.3
Jordan	C01079	10.2	4.2	1.1
Jordan	C01085	11.0	5.0	1.2
average ( )		(10.5)	(4.7)	(1.2)
Jessup	C02169	10.5	4.4	1.4
Jessup	C02070	9.3	4.2	.94
Jessup	C02071	10.8	4.7	1.5
average ( )		(10.2)	(4.4)	(1.28)
B. Bi-pointed - ovoid bifaces				
Jessup	C02357	10.8	3.7	1.3
Jessup	C02082	13.7	3.6	1.2
Jessup	C02135	10.3	3.5	1.7
average ( )		(11.6)	(3.6)	(1.4)
C. Large Bifaces - various shapes (2 largest averaged)				
Jordan	C01071	25.6	11.2	2.0
Jordan	C01073	27.5	10.4	1.5
average ( )		(26.6)	(10.8)	(1.8)
Jordan	C01067	10.8	6.6	1.2

Level Two: Behavior Unit Analysis

Behavior units comprise the basic building block of the cognitive process approach. The behavior units are identified from the average morphology as found on experimental specimens and are summarized in Tables 21 and 22. Behavior units consist of the extent of the effect (i.e., moderate, minimum force, etc.), the type of behavior (i.e., percussion, pressure, etc.), and the tool used (billet, hammerstone, etc.). Behavior units are, in a sense, a theoretical construct used to describe tool using, motor behavior, and resulting effect. They are theoretical or idealized in that, on an actual artifact there are no such things as behavior units, only production units. The difference is, that while each experimentally derived behavior unit is an observable and unique entity, each behavior unit on an artifact must have a specific function which makes it a production unit. One behavior unit can be used for several different purposes. Behavior units are universal constructs in that percussion flaking, for example, is found on a world wide distribution throughout all time periods. A particular behavior unit does not, therefore, provide definitive cultural information. Table 21 lists, by individual artifact, the complete range of behavior units identified from flake scars on the Jordan site artifacts. Table 22 presents similar data for the Jessup site. It is interesting to note, in a comparison of the two sites on Table 23, that even at this non-definitive stage some differences are observable between the two sites. The Jordan site has a high incidence of indirect percussion thinning, billet percussion thinning and shaping as compared to predominantly hammerstone thinning and shaping at the Jessup site. The Jordan site also has more pressure flaking and pressure rubs than the Jessup site. Other behavior units are more or less shared equally between the sites.

As this level of analysis is at a restricted level in terms of cultural inference, no conclusions are presented here regarding the technological nature of the assemblage. Conclusions are discussed in detail at levels three and four of this analysis.

Table 21:

Listing of Behavior Units at the Jordan Site (DeHa-8)
by Individual Artifact with Reference to
Experimental Collection

Prehistoric Artifact	Behavior Unit	Experimental Reference Specimen
C01083	Sub. Press. Thin with P.F.	AB8-6
	Min. Rub Buffet Hammerstone	AB10-1(a)
	Sub. Indirect Percussion Thin	AB11-11
	Mod. Perc. Thin Billet	AB5-9(a)
C01085	Mod.-Sub. Perc. Thin Hammerstone	AB16-7(a)
	Minimum Pressure Rub with P.F.	AB2-2(b)
	Moderate Percussion Shape Hammerstone	AB3-17
	Sub. Indirect Percussion Thin	AB11-11
	Mod./Sub. Shear Shape with P.F.	AB6-13(b)
C01079	Mod. Perc. Shape Billet	AB15-18(a)
	Min. Pressure Rub with P.F.	AB2-2(b)
	Sub. Indirect Percussion Thin	AB11-11
	Sub. Perc. Thin Billet	AB7-10
	Min. Press. Shape with P.F.	AB13-15
	Sub. Press. Thin with P.F.	AB8-6
C01067	Sub. Indirect Percussion Thin	AB11-11
	Min. Rub Buffet Hammerstone	AB10-1(a)
	Mod.-Sub. Shear Shape with P.F.	AB6-13(b)
	Min. Perc. Shape Billet	AB15-18(b)
	Sub. Press. Thin with P.F.	AB8-6
C01073	Sub. Indirect Percussion	AB11-11
	Mod.-Sub. Pressure Thin with P.F.	AB8-6
	Min. Pressure Thin with P.F.	AB9-5(b)
	Min. Pressure Rub with P.F.	AB2-2(b)
	Sub. Percussion Thin Billet	AB7-10
	Mod. Percussion Thin Billet	AB5-9(b)
C01071	Sub. Pressure Thin with P.F.	AB8-6
	Mod. Perc. Thin Billet	AB5-9(b)
	Sub. Indirect Percussion Thin	AB11-11
	Min. Pressure Rub with P.F.	AB2-2(b)
	Sub. Perc. Thin Billet	AB7-10
	Min. Press. Thin with P.F.	AB9-5(b)

Table 22:

Listing of Behavior Units at the Jessup Site (DdGw-2) by Individual Artifact with Reference to Experimental Collection

Prehistoric Artifact	Behavior Unit	Experimental Reference Specimen
C02169	Mod.-Sub. Perc. Thin Hammerstone	AB16-7(a)
	Min. Pressure Rub with P.F.	AB2-2(b)
	Min. Press. Thin with P.F.	AB9-5(b)
C02357	Mod.-Sub. Perc. Thin Hammerstone	AB16-7(a)
	Moderate Sub. Shear Shape with P.F.	AB6-13(b)
C02135	Moderate Perc. Thin Billet	AB5-9(b)
	Substantial Perc. Thin Billet	AB7-10
	Min. Shear Shape with P.F.	AB6-13(a)
	Sub. Pressure Thin with P.F.	AB8-6
	Min. Pressure Thin with P.F.	AB9-5(b)
C02082	Mod. Sub. Perc. Thin Hammerstone	AB16-7(a)
	Mod. Sub. Shear Shape with P.F.	AB6-13(b)
	Mod. Perc. Shape with Hammerstone	AB3-17
	Min. Rub Buffet Hammerstone	AB10-1(a)
C02070	Mod.-Sub. Perc. Thin Hammerstone	AB16-7(a)
	Min. Press. Shape with P.F.	AB13-15
	Sub. Press. Thin with P.F.	AB8-6
	Min. Press. Rub with P.F.	AB2-2(b)
	Mod. Perc. Shape Hammerstone	AB3-17
	Min. Platform Isolating with P.F.	AB2-2(c)
C02071	Mod. Sub. Percussion Thin Hammerstone	AB16-7(a)
	Mod. Perc. Shape Hammerstone	AB3-17
	Min. Rub Buffet Hammerstone	AB10-1(a)

SUMMARY OF BEHAVIOR UNITS

JORDAN SITE — DeHa-8						BEHAVIOR UNIT	JESSUP SITE — DdGw-2					
6	5	4	3	2	1		1	2	3	4	5	6
▨	▨	▨	▨	▨	▨	SUBSTANTIAL INDIRECT PERCUSSION THIN						
		▨	▨	▨	▨	MOD.- SUB. PERCUSSION THIN BILLET	▨					
				▨	▨	MIN.- MOD. PERCUSSION SHAPE BILLET						
					▨	MOD.- SUB. PERCUSSION THIN HAMMERSTONE	▨	▨	▨	▨	▨	
					▨	MODERATE PERCUSSION SHAPE HAMMERSTONE	▨	▨	▨			
		▨	▨	▨	▨	MOD.- SUB. PRESSURE THIN PRESSURE FLAKER	▨	▨				
				▨	▨	MINIMUM PRESSURE THIN PRESSURE FLAKER	▨	▨				
					▨	MINIMUM PRESSURE SHAPE PRESSURE FLAKER	▨					
				▨	▨	MINIMUM RUB BUFFET HAMMERSTONE	▨	▨				
				▨	▨	MOD.- SUB. SHEAR SHAPE WITH PRESSURE FLAKER	▨	▨				
						MINIMAL SHEAR SHAPE WITH PRESSURE FLAKER	▨					
		▨	▨	▨	▨	MINIMUM PRESSURE RUB WITH PRESSURE FLAKER	▨	▨				

Table 23

Level Three: Production Unit Analysis

As defined previously, behavior units consist of the extent of effect, type of behavior and tool used (for example, moderate percussion thin with billet). When a specific function is added, such as margin contouring, the behavior unit becomes a production unit. The variables comprising the known range of the most common behavior and production units are given in Table 11 of this thesis. The table also contains a reference number which can be used to describe each behavior or production unit in code, if appropriate. The overall or total repertoire of production units for each artifact from the Jordan site is presented in Table 24, and the total repertoire of production units for each artifact from the Jessup site is presented in Table 25. The data from both sites is combined and contrasted in Table 26 which serves as a summary of the total stone tool manufacturing repertoires at the two sites.

An examination of overall repertoires (Table 26) reveals that the Jessup site has a predominance of hammerstone face paring and shaping percussion work and more margin moving and contouring production units. This may relate to the fact that Jessup is a quarry-workshop site where preforms are being made. Production of quarry blanks, preforms or rough-outs, would require more shaping and edge angle, decreasing and/or increasing production units. In contrast, the Jordan site has a predominance of billet indirect percussion thin and billet percussion thinning and shaping units. Pressure flaking is used more extensively at Jordan than at Jessup as are edge units such as substantial margin regularizing.

Table 26 also contains a reference number for each production unit (extreme left hand column - Table 26). These code or reference numbers will be used extensively in the remainder of the analysis to facilitate compilation of flow charts and comparative discussions. Table 27 lists the production unit reference numbers for each artifact.

Besides the major differences of indirect percussion and billet versus hammerstone units found between the two sites, other differences should be noted. Some units are unique to each site. The Jordan site contains production units 4, 6, 8, 10 and 14 not found at the Jessup site. The Jessup site contains production units 7, 13, 15, 18 and 20 not found at the Jordan site. Following the comparison of production units in Tables 26 and 27, a matrix chart (Table 28) can be used to outline a basic patterning of results not readily discernible from the previous tables. If one examines the artifacts with over 50% of shared production units, distribution patterns are evident. These can be illustrated by means of Figure 52 which shows the relationships of specimens with over 50% of similar production units. Plotting of relationships of less then 50% is not practical on this type of explanatory device. Notable from Figure 52 is the fact that the two sites do not exhibit a great deal of overlap in production units. Four of six artifacts at Jordan, and five of six at Jessup, in-fact, appear to group together in that they share more than 50% of assemblage production units among themselves. Production unit overlap between sites is not extensive and is restricted to one artifact from the Jordan site (C01085) which contains many overlaps with the Jessup site in terms of production units, and one artifact from the Jessup site (C02135) which contains many overlaps with the Jordan site. A notable observation is that artifacts C01071 and C01073 from the Jordan site and artifacts C02082 and C02070 from the Jessup site appear to be "key" artifacts in that they contain the basic or core production units used at each site. All four are completely finished specimens which may partly account for their status. It is especially evident in specimen C02082 which is closely associated with two artifacts, C02071 and C02357, which are at an earlier stage of manufacture.

This level of analysis differs from the preceding shape and metric analysis in that it demonstrates that the lanceolate shaped, convex based specimens are not grouped together in terms of methods used for their production. Five of the six can be related to one of two specific sites while the sixth, C01085, at this level of analysis appears to be a possible candidate for the site other than the one in which it was found.

The large bifaces, due to shared production units, would appear to be part of the Jordan site repertoire and represent a core group for this site. Of note is the close association between the large bifaces and a smaller biface, C01079. This indicates that the large and small bifaces at the site are perhaps closely associated despite the enormous size differences.

The uniquely shaped semi-lunate biface from Jordan (C01067) appears also to be only peripherally connected to the large bifaces at this level of analysis.

Finally, two of the three (C02082, C02357) Jessup bi-pointed ovoid bifaces, as indicated by shape and metrics, are confirmed by the production unit data to be part of the Jessup site. The third, however, (C02135) appears at this point to have closer ties to the Jordan site.

Following the production unit analysis, the next step is to proceed to the highest level of analysis which involves the sequence of production units used to manufacture the specimen. This should allow for better pattern recognition. Although many artifacts may have production units in common, these units may not have been applied in the same sequence during manufacture.

Table 24: Listing of Production Units at the Jordan Site (DeHa-8) by Individual Artifact

Artifact #	Production Unit	Production Unit Code (from Table 1)
C01083	Face-Paring - Very Sub. Indirect Perc.	40:5,51,51
	Face-Paring - Mod. Perc. thin B.	40:3,41,51
	Margin-Contouring - Sub. Press. thin P.F.	31:4,31,31
	Edge-Dulling - Min. Rub Buffet H.	21:1,12,41
	Edge-Centering, Straightening, and Regularizing - Min. Shear Shape P.F.	23/24/25:2,22,31
C01085	Face-Paring - Ver Sub. Indirect Perc.	40:5,51,51
	Face-Paring - Sub. Perc. thin H.	40:4,41,41
	Margin-Moving - Mod. Perc. Shape H.	33:3,42,41
	Edge-Thickening - Min. Press. Rub with P.F.	21:2,13,31
	Edge-Centering, Straightening, and Regularizing - Min. Shear Shape with P.F.	23/24/25:2,22,31
C01079	Face-Paring - Sub. Perc. thin B.	40:4,41,51
	Face-Paring - Very Sub. Indirect Perc.	40:5,51,51
	Margin-Moving - Mod. Perc. Shape B.	33:3,42,51
	Margin-Regularizing - Sub. Pressure thin P.F.	30:4,41,31
	Margin-Moving - Min. Press. Shape P.F.	33:2,32,31
	Edge-Thickening - Min. Press. with Rub P.F.	21:1,13,31

Table 24 continued.

Artifact #	Production Unit	Production Unit Code (from Table 1)
C01067	Face-Paring - Very Sub. Indirect Perc.	40:5,51,51
	Face-Paring - Mod. Sub. Press. thin P.F.	40:3/4,31,31
	Margin-Contouring - Min. Perc. Shape Billet	31:2,42,51
	Edge-Dulling - Min. Rub/Buffet H.	20:2,12,41
	Edge-Centering, Straightening, and Regularizing - Mod. Sub. Shear Shape P.F.	23/24/25:3/4,22,31
C01073	Face-Paring - Very Sub. Indirect Perc.	40:5,51,51
	Face-Paring - Mod. Sub. Perc. thin B.	40:4,41,41
	Margin-Regularizing - Mod. Sub. Perc. thin B.	31:3/4,41,41
	Face-Paring - Min. Press. thin P.F.	40:2,31,31
	Face-Paring - Mod. Sub. Press. thin P.F.	40:3/4,31,31
	Margin-Regularizing - Mod. Sub. Press. thin P.F.	31:3/4,31,31
	Edge-Thickening - Min. Pressure Rub with P.F.	21:1,13,31
C01071	Face-Paring - Very Sub. Indirect Perc.	40:5,51,51
	Face-Paring - Mod. Sub. Perc. thin B.	40:4,41,41
	Face-Paring - Mod. Sub. Press. thin P.F.	40:3/4,31,31
	Face-Paring - Min. Press. thin P.F.	40:2,31,31
	Margin-Regularizing - Mod. to Sub. Press. thin P.F.	30:3/4,31,31
	Margin-Contouring - Mod. to Sub. Press. thin P.F.	31:3/4,31,31
	Edge-Thickening - Min. Pressure Rub with P.F.	21:1,13,31

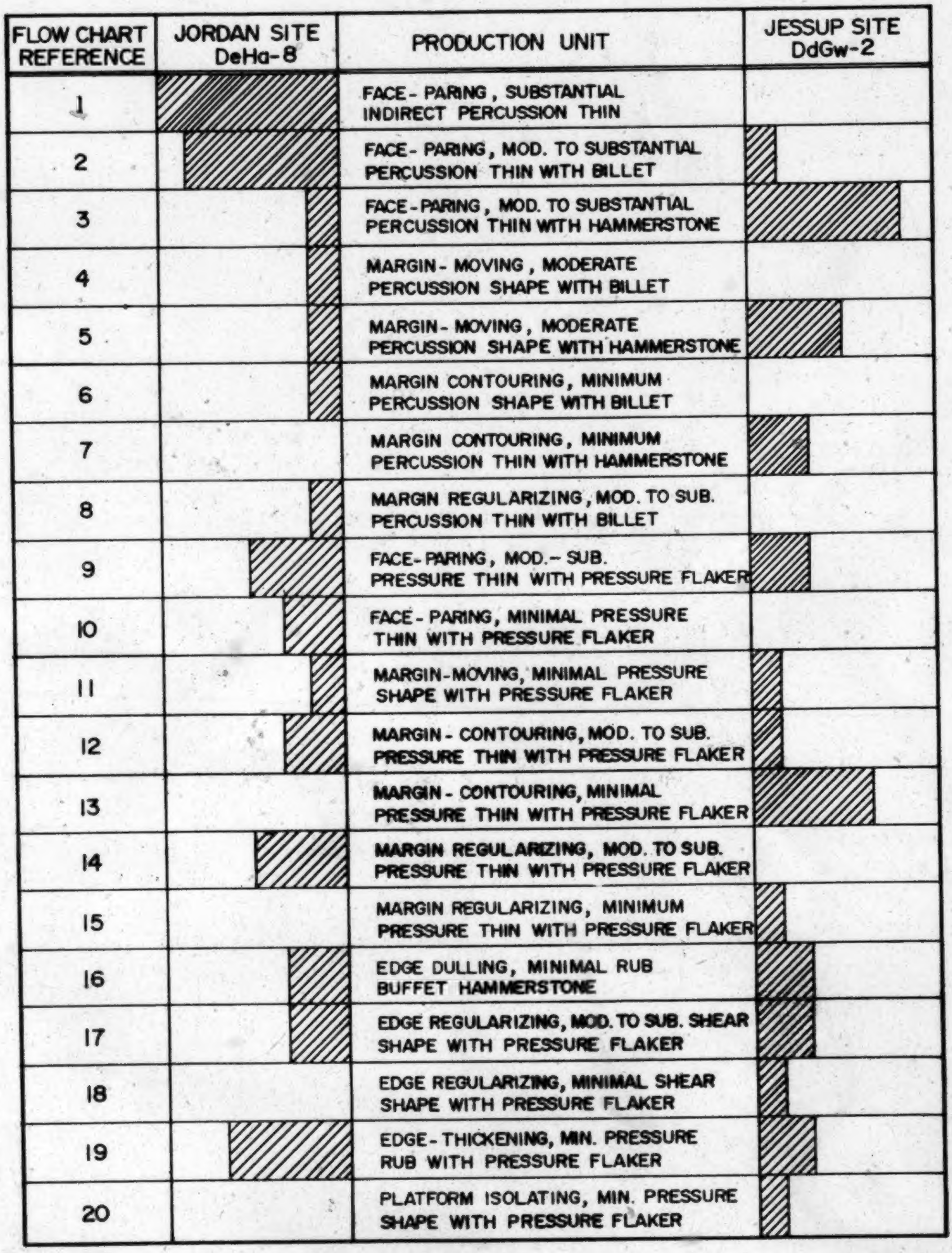
Table 25: Listing of Production Units at the Jessup Site (DdGw-2) by Individual Artifact

Artifact #	Production Unit	Production Unit Code (from Table 1)
C02169	Face-Paring - Sub. Perc. thin H.	40:4,51,51
	Face-Paring - Mod. Perc. thin H.	40:3,51,51
	Margin-Regularizing - Min. Press. thin P.F.	30:2,31,31
	Margin-Contouring - Min. Press. thin P.F.	31:2,31,31
	Edge-Thickening - Min. Press. Rub P.F.	21:2,13,31
C02357	Face-Paring - Mod. Sub. Perc. thin H.	40:3/4,41,41
	Margin-Contouring - Mod. Sub. Perc. thin H.	31:3/4,41,41
	Edge- Centering, Straightening, and Regularizing - Mod. Sub. Shear Shape P.F.	23/24/25:3/4,22,31
C02135	Face-Paring - Mod. Sub. Perc. thin B.	40:3/4,41,51
	Face-Paring - Mod. Sub. Pressure thin P.F.	40:3/4,31,31
	Margin-Contouring - Mod. Sub. Press. thin P.F.	31:3/4,31,31
	Margin-Contouring - Min. Sub. Press. thin P.F.	31:2,31,31
	Edge-Centering, Straightening and Regularizing - Min. Shear Shape P.F.	23/24/25:2,22,31

Table 25 continued.

Artifact #	Production Unit	Production Unit Code (from Table 1)
C02082	Face-Paring - Mod.-Sub. Perc. thin H.	40:3/4,41,41
	Margin-Moving - Mod. Perc. Shape H.	33:3,42,41
	Margin-Contouring - Mod. Perc. thin H.	31:3,41,41
	Edge-Dulling - Min. Rub Buffet H.	20:2,12,41
	Edge-Centering, Straightening, and Regularizing - Mod. Sub. Shear Shape P.F.	23/24/25:2/4,22,31
C02070	Face-Paring - Mod.-Sub. Perc. thin H.	40:4,51,41
	Margin-Moving - Mod. Perc. Shape H.	33:3,42,41
	Margin-Contouring - Min. Press. thin P.F.	31:2,41,31
	Face-Paring - Mod.-Sub. Pressure thin P.F.	40:3/4,42,31
	Margin-Moving - Min. Pressure Shape P.F.	33:2,32,31
	Edge-Thickening - Min. Press. Rub with P.F.	21:1/2,13,31
	Platform-Isolating - Min. Press. Shape with P.F.	34:2,32,31
C02071	Face-Paring - Mod.-Sub. Perc. thin H.	40:3/4,41,41
	Margin-Moving - Mod. Perc. Shape H.	33:3,42,41
	Edge-Dulling - Min. Rub Buffet H.	20:2,12,41

SUMMARY OF PRODUCTION UNIT REPERTOIRE



FLOW CHART REFERENCE	JORDAN SITE DeHa-8	PRODUCTION UNIT	JESSUP SITE DdGw-2
1	▨	FACE-PARING, SUBSTANTIAL INDIRECT PERCUSSION THIN	
2	▨	FACE-PARING, MOD. TO SUBSTANTIAL PERCUSSION THIN WITH BILLET	▨
3	▨	FACE-PARING, MOD. TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE	▨
4	▨	MARGIN-MOVING, MODERATE PERCUSSION SHAPE WITH BILLET	
5	▨	MARGIN-MOVING, MODERATE PERCUSSION SHAPE WITH HAMMERSTONE	▨
6	▨	MARGIN CONTOURING, MINIMUM PERCUSSION SHAPE WITH BILLET	
7		MARGIN CONTOURING, MINIMUM PERCUSSION THIN WITH HAMMERSTONE	▨
8	▨	MARGIN REGULARIZING, MOD. TO SUB. PERCUSSION THIN WITH BILLET	
9	▨	FACE-PARING, MOD.– SUB. PRESSURE THIN WITH PRESSURE FLAKER	▨
10	▨	FACE-PARING, MINIMAL PRESSURE THIN WITH PRESSURE FLAKER	
11	▨	MARGIN-MOVING, MINIMAL PRESSURE SHAPE WITH PRESSURE FLAKER	▨
12	▨	MARGIN-CONTOURING, MOD. TO SUB. PRESSURE THIN WITH PRESSURE FLAKER	▨
13		MARGIN-CONTOURING, MINIMAL PRESSURE THIN WITH PRESSURE FLAKER	▨
14	▨	MARGIN REGULARIZING, MOD. TO SUB. PRESSURE THIN WITH PRESSURE FLAKER	
15		MARGIN REGULARIZING, MINIMUM PRESSURE THIN WITH PRESSURE FLAKER	▨
16	▨	EDGE DULLING, MINIMAL RUB BUFFET HAMMERSTONE	▨
17	▨	EDGE REGULARIZING, MOD. TO SUB. SHEAR SHAPE WITH PRESSURE FLAKER	▨
18		EDGE REGULARIZING, MINIMAL SHEAR SHAPE WITH PRESSURE FLAKER	▨
19	▨	EDGE-THICKENING, MIN. PRESSURE RUB WITH PRESSURE FLAKER	▨
20		PLATFORM ISOLATING, MIN. PRESSURE SHAPE WITH PRESSURE FLAKER	▨

Table 26

Table 27:

Listing of Production Unit Sequences for Each Artifact

(a) Jordan DeHa-8

Artifact	Production Unit Numbers from Table 26	Table Containing Artifact Analysis
C01083:	0 → 1,2 → 12 → 16,18	(Table 59)
C01085:	0 → 1,3 → 5 → 17,19	(Table 60)
C01079:	0 → 1,2 → 4,11,14 → 19	(Table 61)
C01067:	0 → 1 → 6,9 → 16,17	(Table 62)
C01073:	0 → 1,2 → 8,9,10,14 → 19	(Table 18)
C01071:	0 → 1,2 → 9,10,12,14 → 19	(Table 63)

(b) Jessup DdGw-2

Artifact	Production Unit Numbers from Table 26	Table Containing Artifact Analysis
C02169:	0 → 3 → 13,15 → 19	(Table 64)
C02357:	0 → 3 → 7 → 17	(Table 65)
C02135:	0 → 2 → 9,12,13 → 18	(Table 66)
C02082:	0 → 3 → 5,7 → 16,17	(Table 67)
C02070:	0 → 3 → 5,9,11,13 → 19,20	(Table 68)
C02071:	0 → 3 → 5 → 16	(Table 69)

→ Arrows indicate approximate sequences in manufacturing (primary units - secondary units - edge units)

0 = Original core or flake core

MATRIX CHART
SHOWING PERCENT (%) OF SHARED PRODUCTION UNITS FOR JORDAN & JESSUP SITES

	JORDAN						JESSUP					
JORDAN CO 1073 to CO 1085	CO 1073	CO 1071	CO 1079	CO 1083	CO 1067	CO 1085	CO 2135	CO 2070	CO 2169	CO 2357	CO 2082	CO 2071
CO 1073	▨	85	66	40	40	40	40	40	25			
CO 1071	85	▨	66	60	40	40	60	28	25			
CO 1079	66	66	▨	40	20	40	20	33	25			
CO 1083	40	60	40	▨	20	20	60				20	33
CO 1067	40	40	20	20	▨	40	20	20		33	40	33
CO 1085	40	40	40	20	40	▨		60	50	66	60	66
CO 2135	40	60	20	60	20		▨	40				
CO 2070	40	28	33		20	60	40	▨	75	33	40	66
CO 2169	25	25	25			50		75	▨	33	20	33
CO 2357					33	66		33	33	▨	100	33
CO 2082				20	40	60		40	20	100	▨	100
CO 2071				33	33	66		66	33	33	100	▨
JESSUP CO 2135 to CO 2071												

Table 28

ARTIFACTS WITH OVER 50% OF SHARED PRODUCTION UNITS

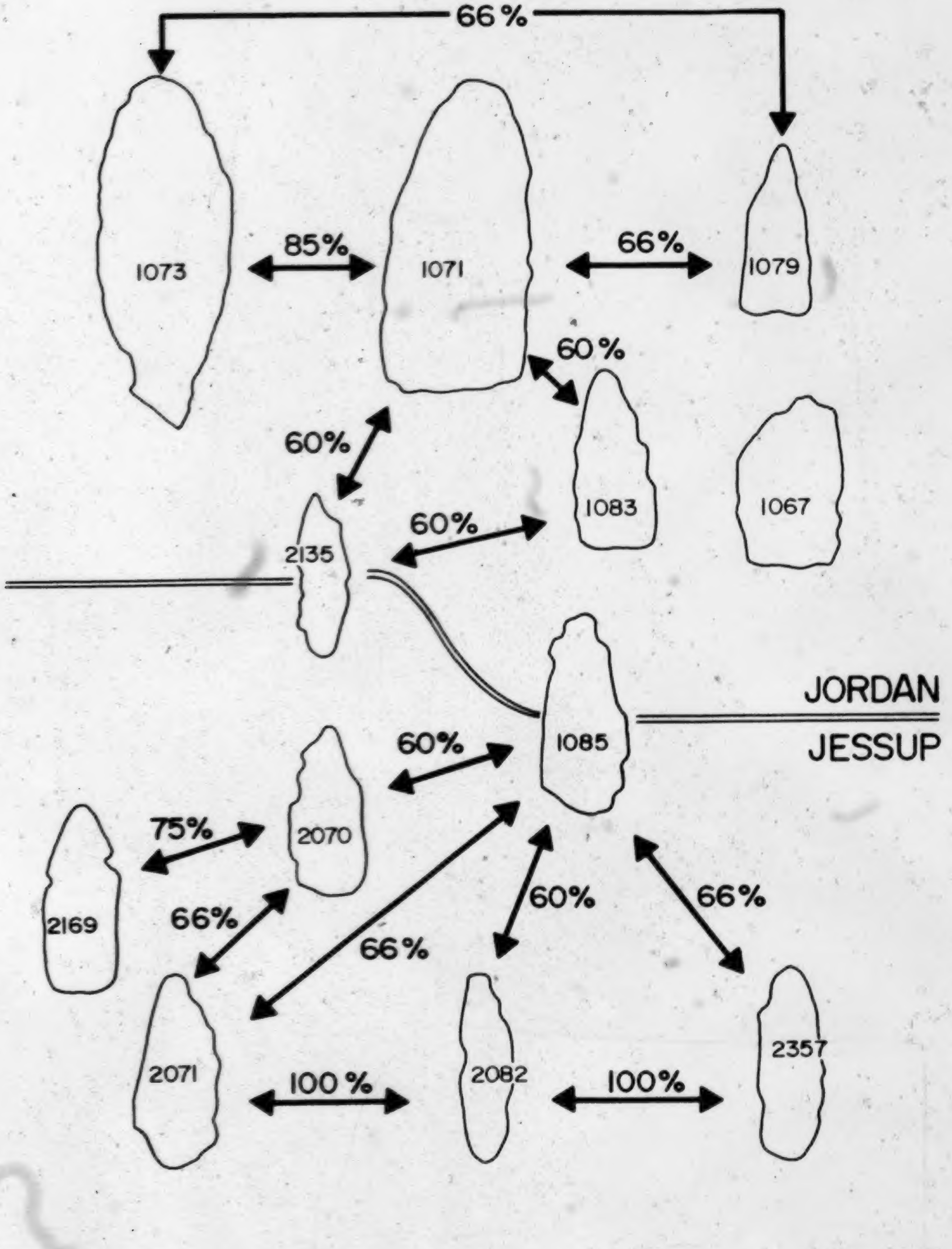

66%
1073
85%
1071
66%
1079
60%
60%
1083
1067
60%
2135
JORDAN
JESSUP
1085
60%
2070
75%
2169
66%
66%
60%
66%
2071
100%
2082
100%
2357

Figure 16

Level Four: The Sequence of Production Units Used in Artifact Manufacturing

This analysis uses reference numbers representing each production unit (from Table 27) to prepare flow charts illustrating the production procedure. The different reference numbers and basic production sequences for each artifact are drawn from Tables 59 to 69, 24, 25 and 26. The data from Table 27 can be compared and analyzed by use of an illustrated flow diagram of production unit artifacts at each site (Figures 17 and 18). These two figures illustrate the various production unit sequences for each artifact and site utilizing the flow chart reference numbers taken from Table 26. The production unit flow diagram representing the sequence of units used to craft each specimen is our basic unit of analysis for level four.

Through an examination of the flow diagrams, the specific production unit sequences for each artifact can be identified and listed (Table 29). This information can then be plotted on a matrix chart (Table 30) to identify any trends within or between the two sites. This data (note that the patterning of sequences produces a better pattern resolution the more generalized the production unit matrix chart) can then be used to illustrate overall relationships (Figure 19). Some final observations from Figure 19 can now be made regarding the technological nature of the two site assemblages. First, it is interesting to remember from the level three analysis that the "core" groups from each of the two sites are mutually discrete and that there is virtually no overlap in core group production units between the sites. This discreteness of sites is confirmed by the analysis of production unit sequencing.

In contrast to the initial shape and metric analysis which showed the convex based lanceolate bifaces from both sites to be part of a single grouping, the patterning of production unit sequences clearly separates each into their respective site groups. The overlap suggested from the level three production unit data indicating that one of the specimens from each site may be connected technologically to the other site (C02135 and C01085) is diminished here and indicates a relatively weak connection (17% or less). The site specific "core" artifact production repertoire is confirmed for each site with production unit sequence overlaps of 33 to 66% for the Jessup site and 28 to 77% for the Jordan site. These within-site correlations are much stronger than intra-site correlations which range from 0 to 17%.

The large bifaces at the Jordan site (C01071, C01073) are indicated by both production unit and sequence analysis to be part of the same technology which produced two of the smaller bifaces (C01079 and C01083) at the Jordan site despite their enormous size differences and, in the case of C01073, a significant size and shape difference.

The sequence analysis of production units also confirms the fact (as also indicated from the level one and two analysis) that the bipointed ovoid artifacts (C02357, C02082, C02135) from the Jessup site are unique to that site, in all aspects (i.e., shape, metrics, production units used and sequencing of production units).

Figure 19 also shows that when production unit sequences are taken into account, artifact C02135, thought to be a possible connector or overlap artifact on the basis of production units alone, clearly is not a connector. In a similar fashion the other two specimens which showed strong inter-site connections at the production unit level, C02070 and C01085 retain this distinction at the level four analysis but the degree of intra-site technological sharing has been severely reduced. The degree of overlap is not considered sufficient to place any of the four artifacts with weakly developed technological affinities (C01067, C01085, C02135, C02070) into a site assemblage other than the ones in which they were found.

Figure 19 also indicates that artifact C01067 is only weakly connected to the other Jordan site bifaces. This may be due to the fact that this tool may be part of a different techno-type as this artifact has an extensive scraping face along one edge and, therefore, might be classified as a scraper. If other scrapers from the Jordan site were analyzed, this specimen might be found to have closer relationships to them rather than the biface group.

JORDAN SITE
PRODUCTION UNIT FLOW DIAGRAMS

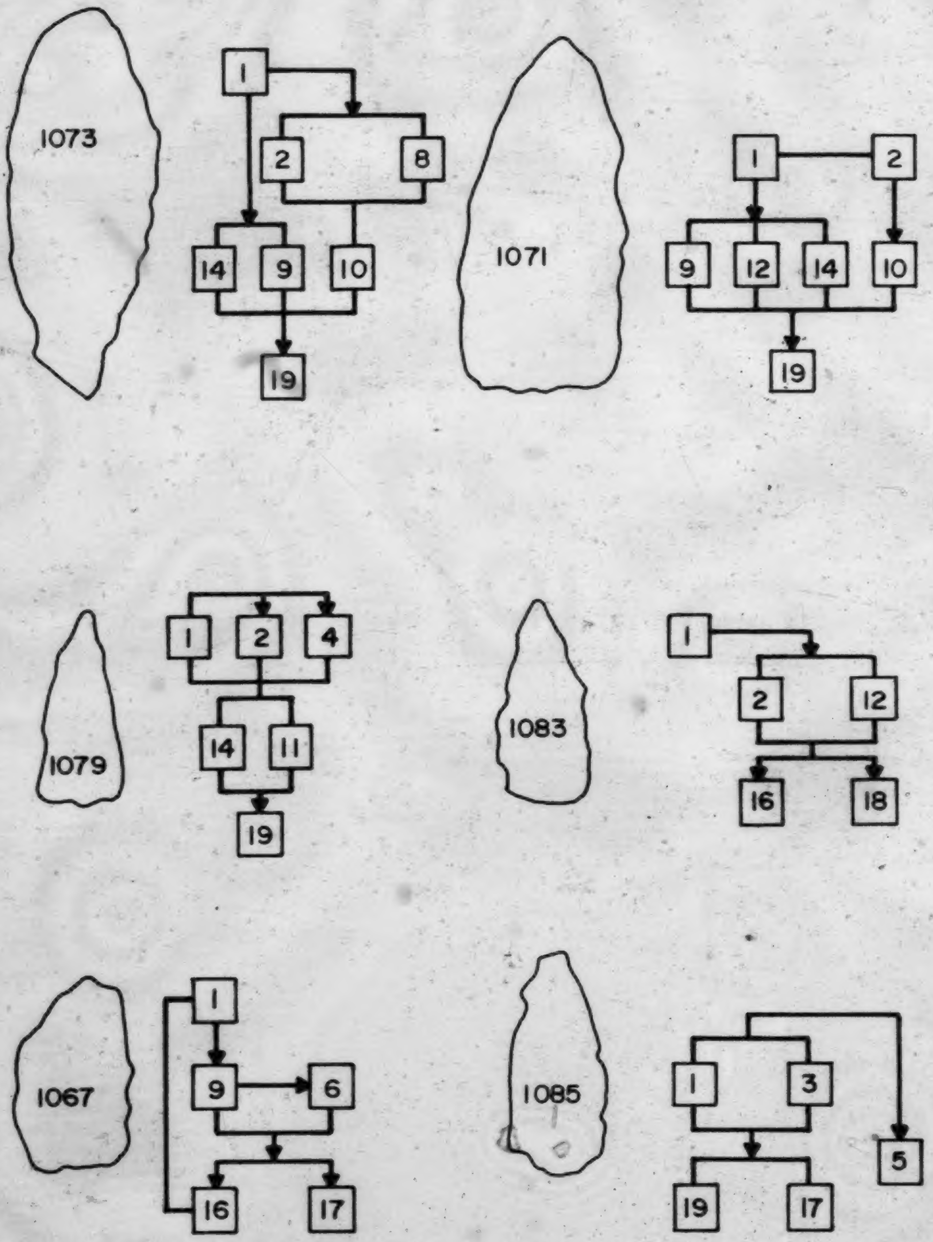

1073
1
2
8
14
9
10
19
1071
1
2
9
12
14
10
19
1079
1
2
4
14
11
19
1083
1
2
12
16
18
1067
1
9
6
16
17
1085
1
3
5
19
17

Figure 17

JESSUP SITE
PRODUCTION UNIT FLOW DIAGRAMS

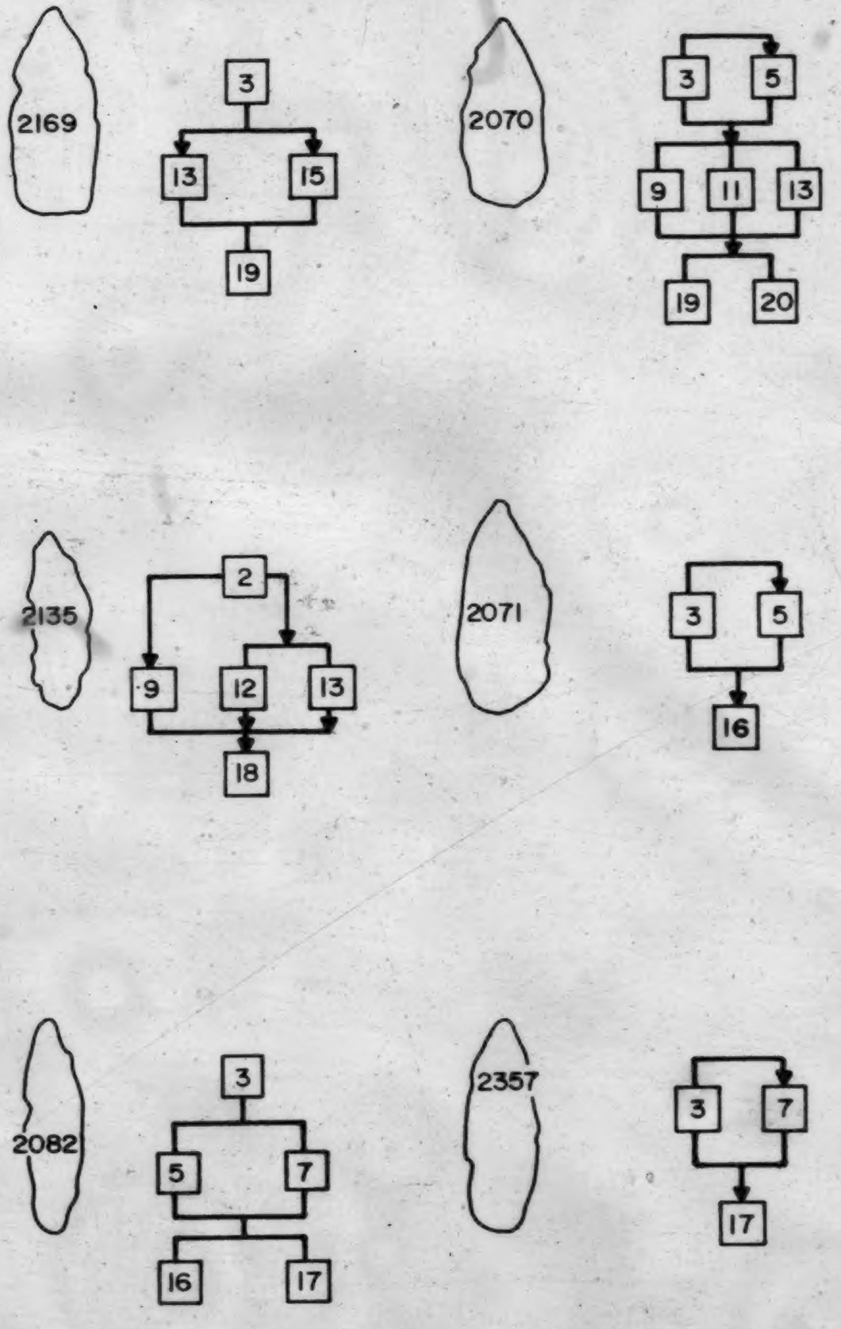

2169
3
13
15
19
2070
3
5
9
11
13
19
20
2135
2
9
12
13
18
2071
3
5
16
2082
3
5
7
16
17
2357
3
7
17

Figure 18

Table 29:

(a) Jordan Site (DeHa-8)
Production Unit Sequences for Individual Artifacts

C01073

1. 1-2
2. 1-8
3. 1-14
4. 1-9
5. 9-19
6. 2-10
7. 8-10
8. 10-19
9. 14-19
10. 9-19

C01071

1. 1-2
2. 1-9
3. 1-14
4. 1-12
5. 2-10
6. 9-19
7. 14-19
8. 12-19
9. 10-19

C01079

1. 1-2
2. 1-4
3. 1-14
4. 1-11
5. 2-14
6. 2-11
7. 4-14
8. 4-11
9. 14-19
10. 11-19

C01083

1. 1-2
2. 1-12
3. 2-16
4. 2-18
5. 12-16
6. 12-18

C01067

1. 1-9
2. 1-16
3. 1-6
4. 9-16
5. 9-17
6. 6-16
7. 6-17

C01085

1. 1-3
2. 1-5
3. 3-5
4. 1-19
5. 1-17
6. 3-19
7. 3-17

Table 29 continued.

(b) Jessup Site (DdGw-2)
Production Unit Sequences for Individual Artifacts

C02357

1. 3-7
2. 3-17
3. 7-17

C02082

1. 3-5
2. 3-7
3. 5-17
4. 5-16
5. 7-17
6. 7-16

C02071

1. 3-5
2. 3-16
3. 7-16

C02070

1. 3-5
2. 3-13
3. 3-9
4. 3-11
5. 5-13
6. 5-9
7. 5-11
8. 13-19
9. 13-20
10. 9-19
11. 9-20
12. 13-19
13. 13-20

C02169

1. 3-13
2. 3-15
3. 13-19
4. 15-19

C02135

1. 2-9
2. 2-12
3. 2-13
4. 9-18
5. 12-18
6. 13-18

MATRIX CHART
SHOWING PERCENT (%) OF SHARED PRODUCTION UNIT SEQUENCES FOR JORDAN & JESSUP SITES

	JORDAN						JESSUP					
JORDAN CO 1073 to CO 1085	CO 1073	CO 1071	CO 1079	CO 1083	CO 1067	CO 1085	CO 2135	CO 2070	CO 2169	CO 2357	CO 2082	CO 2071
CO 1073	▨	77	25	14				13				
CO 1071	77	▨	33	28	14			11				
CO 1079	25	33	▨	14								
CO 1083	14	28	14	▨								
CO 1067	14	14			▨	14						
CO 1085					14	▨		14			14	
CO 2135				17			▨	17				
CO 2070	12	11				14		▨	50		17	33
CO 2169								50	▨			
CO 2357										▨	66	
CO 2082										66	▨	66
CO 2071											66	▨
JESSUP CO 2135 to CO 2071												

Table 30

ARTIFACTS WITH OVER 14% OF SHARED PRODUCTION UNIT SEQUENCES

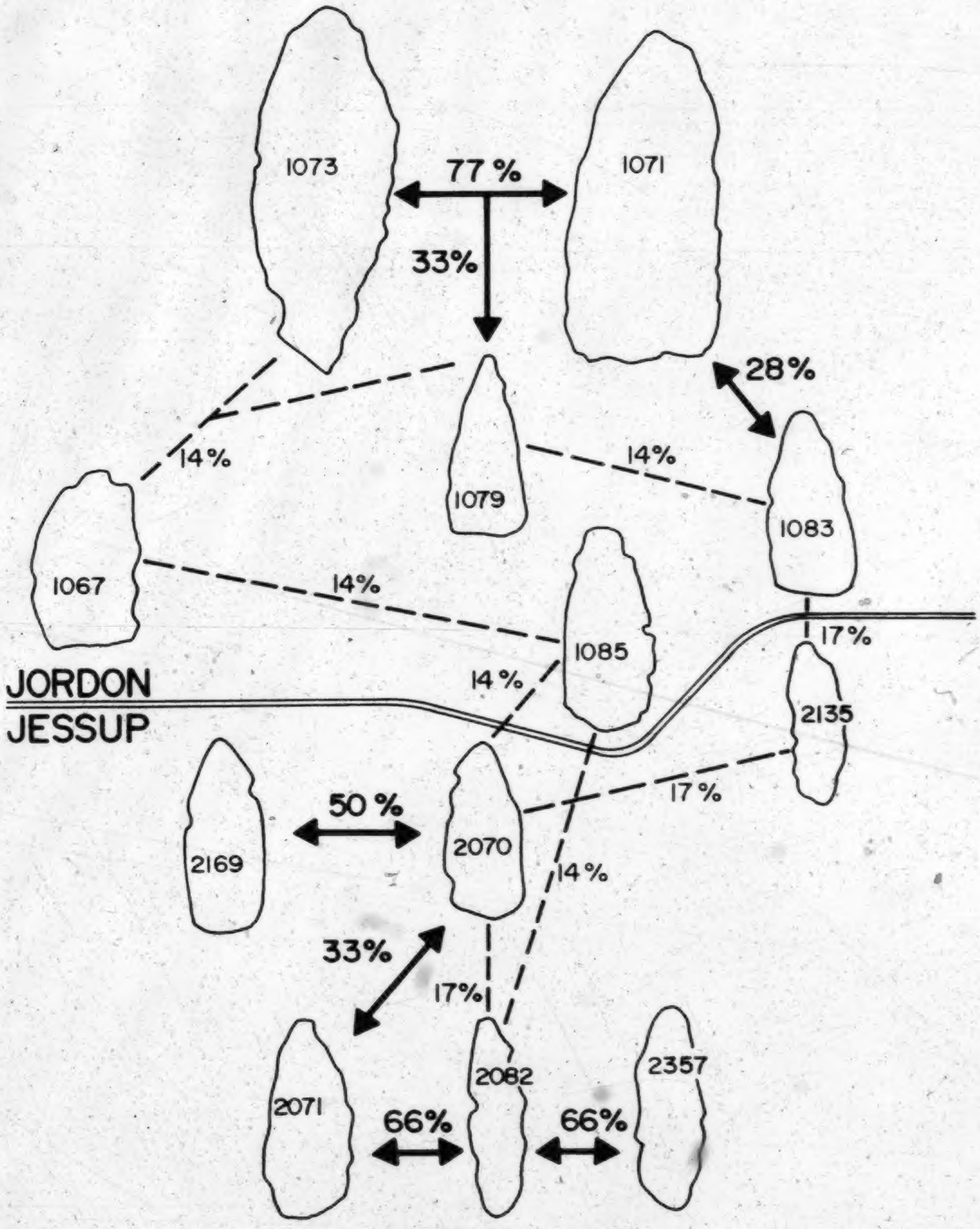

1073
77 %
1071
33%
28%
14%
14%
1079
1083
1067
14%
1085
17%
JORDON
14 %
JESSUP
2135
50 %
17 %
2169
2070
14%
33%
17%
2071
2082
2357
66%
66%

Figure 19

Production Grammar

By examining the composite branch diagrams (Table 31) the final step of the analysis can be completed. The branch diagrams contain the core repertoires as represented by three artifacts from each site (C01071, C01073 and C01079 from the Jordan site, C02057, C02071 and C02082 from the Jessup site). By analyzing the reasons for the branching of the diagrams, one can arrive at an understanding of the rules governing the use of a technological repertoire. The repertoire, plus the rules, is the most general level of analysis possible and constitutes the production grammar represented either in a single artifact or a group of closely related artifacts.

For the Jordan site the following rules are suggested by the branch diagram (part (a), Table 31). It can be seen at the top of the diagram that there is a choice of four biface thinning units; two percussion (1 and 2) and two pressure techniques (9 & 10).

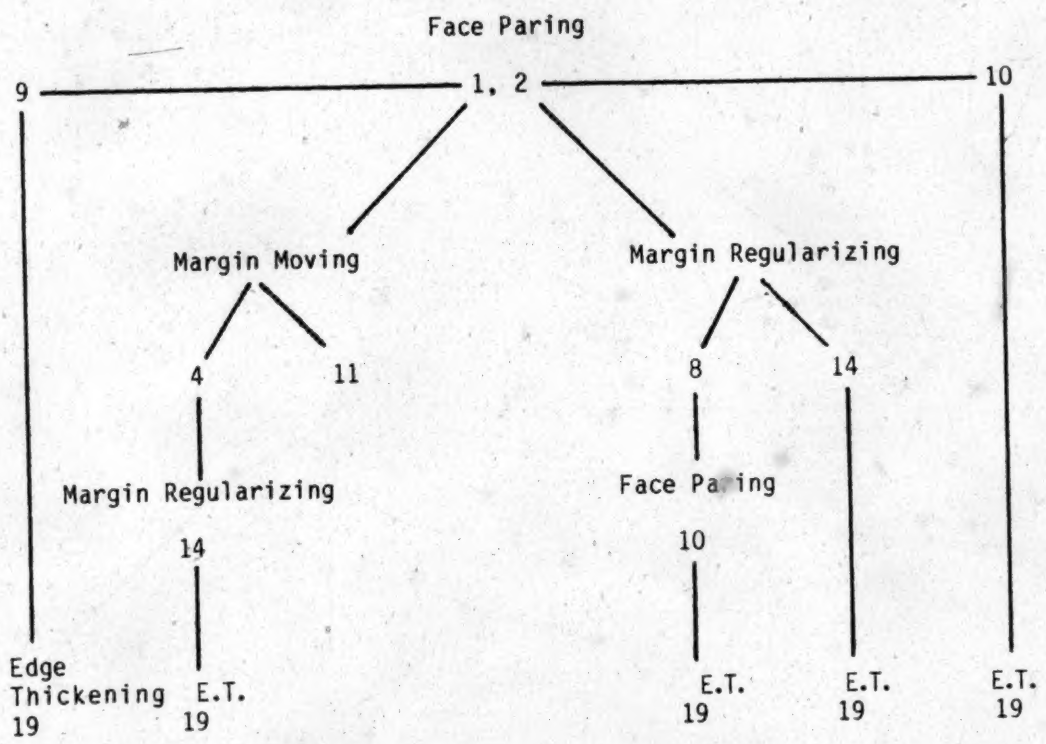
Indirect percussion (1) is a technique capable of removing large, spatulate shape thinning flakes without loss of control (due to the fact that a small antler tool tip is placed directly on the platform and struck with another tool). It is thus most useful for thinning the interior surface regions of large bifaces, as in the case of artifacts #1071 and 1073, or for creating a regular scar pattern.

In contrast, direct percussion with a billet (2) is used either for removing slightly smaller flakes or when a controlled pattern is not critical.

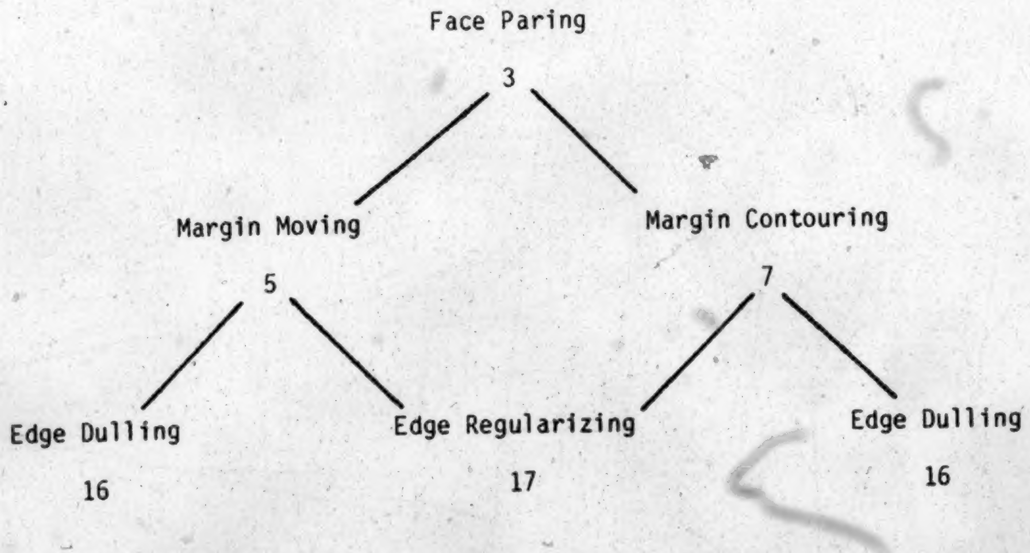
Face paring with a pressure technique (9 or 10), on the other hand, is used to thin the tip or a narrow base where there is danger of

Table 31: Composite Branch Diagrams of Production Strategies

(a) JORDAN SITE


Face Paring
9
1, 2
10
Margin Moving
Margin Regularizing
4
11
8
14
Margin Regularizing
Face Paring
14
10
Edge Thickening 19
E.T. 19
E.T. 19
E.T. 19
E.T. 19

(b) JESSUP SITE


Face Paring
3
Margin Moving
Margin Contouring
5
7
Edge Dulling
Edge Regularizing
Edge Dulling
16
17
16

breaking the artifact with a percussion technique. The best example of this is seen on the tip of the smaller Jordan artifact, #1079.

After face paring, a choice of margin moving production units is available (4 or 11). Moderate percussion shape with a billet (4) is used to move in the edge of the artifact on the main body area, while margin moving with a pressure flaker (11) is used in shaping the tips of all three artifacts and the bases of at least two of the specimens.

After face paring or margin moving, a choice of margin regularizing production units was available to the Jordan craftsman (men) in preparation for additional face paring of sensitive areas with an improper edge angle, such as the tip. These units are margin regularizing with a billet (8) or pressure flaker (14). Both are used to remove the interscar ridges left by indirect or direct percussion face paring techniques. Generally, a percussion technique seems to have been used for larger ridge areas or where the ridge was too thick to be removed by pressure. When feasible, however, a pressure technique allows for greater control.

Following margin regularizing, face paring (10) with a pressure flaker was sometimes used as described above.

All behavior units were followed by an edge thickening unit (19), minimal pressure rub with a pressure flaker. This consists of rubbing the edge with the tip of a pressure flaker, removing some minimal shaping flakes, and thereby strengthening any overly thin portions of the edge.

For the Jessup site, the following rules are observable (see part (b), Table 31).

Only one face paring unit, substantial percussion thin with a hammerstone (3) is used.

After face paring, the craftsman had a choice of margin moving with a hammerstone (5), or margin contouring with a hammerstone (7). Margin moving was used when the artifact needed to be shaped (i.e., artifact C02071) into an ovoid form. Margin contouring, on the other hand, was used when the shape was approximately correct but the margin on one or more faces was too flat (margin contouring creates a curved margin by increasing the edge angle). Margin contouring was used on artifacts such as C02357, which are made from a flake. In this case, margin contouring is used to create a bifacial edge on the original flat flake surface, some of which remains. Both margin moving and contouring units are found on artifact C02082.

After margin moving (5) and/or margin contouring (7), a choice of two edge units was available. These are edge-dulling, minimal rub buffet with a hammerstone (16) and edge-regularizing, mod. to sub. shear shape with a pressure flaker (17). Edge dulling with a hammerstone was used on artifact C02071 to blunt and round or smooth the edge so that it did not crush easily when used as a platform for further flake removals. At this point the artifact broke and was abandoned. If it had not, further work would have been needed to finish the specimen. In contrast, edge regularizing shear shape with a pressure flaker (17) was used on artifacts C02357 and C02082 for final straightening and centering of the edge.

In summary, there is virtually no overlap between the two grammars. The Jordan craftsman produced more symmetrical and better finished artifacts, largely due to techniques which allowed greater control (indirect percussion and pressure flaking). In contrast, the

Jessup artifacts tend to be more irregular in shape and surface detail, having been produced with less controllable techniques such as percussion with hammerstone. With its more limited repertoire, the Jessup site may be more typical of quarry workshops for mass production of preforms.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Introduction

In summarizing the results of this dissertation it should be noted that the major intent was to lead to a better understanding of stone tools through extending the capabilities of lithic analysis, utilizing theoretical constructs based on cognitive anthropology. Using the cognitive approach, a modern craftsman is asked to employ specific behavior units under controlled experimental conditions. The resulting flake scars are then coded in terms of 14 attributes and an average pattern (reference) is compiled for each different kind of behavior unit (see Table 17). This experimental reference set can then be used to identify the type of behavior unit (i.e., substantial percussion thin with hammerstone) responsible for a flake scar on a prehistoric specimen. Once the analyzable scars on an artifact have been identified, it is possible to move to a higher level of analysis by inferring function to produce production units and to reconstruct how these production units are sequenced. It is this final sequence of production units which we feel is determined, at least in part, by the specific cultural context. Thus, while basic shape and metric data, as well as some types of production unit data, are useful and of great assistance in describing stone tools, and may serve as broad time horizon markers, it is sometimes very difficult to relate this data to specific sites or cultures, especially on sites where there is neither good stratigraphy, material for radiocarbon 14 dating nor other forms of archaeological data useful in isolating cultural groups. This thesis has taken two such sites and demonstrated how the cognitive process approach, given the above conditions, can generate information not available from currently utilized methods of stone tool analysis.

Thesis Constraints

Because this thesis represents the first formal application of the cognitive approach to actual prehistoric site assemblages, a great number of difficulties had to be overcome before the analysis could be completed, and it is difficult to resolve all methodological constraints and concerns of a new approach within a single research document. Some of these concerns may involve the small number of prehistoric artifacts analyzed in this thesis. Statistical and sampling procedures used for research in population studies or polls, where the total number of persons and the underlying parameters of the population are known, are difficult to apply in this case as the total numbers of prehistoric artifacts and their characteristics are unknown. For statistical analysis a fair number of specimens would be needed for each site or experiment. Lacking this, a selection of six artifacts from each was made, and these six from each site are treated as site universes in themselves.

The small number of experimental artifacts can be regarded as adequate for the purposes of this thesis. This is due to three factors. First, we are not dealing with a completely unknown phenomena when conducting the experiments, as we already know quite a bit about the underlying behavioral and mechanical parameters before starting. The experiments were based on similar experiments conducted on a wide range of lithic materials, and the craftsman followed predetermined instructions to produce a specific behavior. If this behavior was not successful, failed scars could readily be identified and weeded out of our experimental sample. Theoretically, under these conditions, one perfectly executed flake scar could represent a good part of the attribute universe for that behavior and thus be sufficient for identifying similar scars on prehistoric specimens.

Other criticisms concern the use of the word "analog" to describe the experimentally produced production unit morphologies. These experimental specimens are not analogs in the traditional sense. An analog is something which is similar to something else and contains the inference that if two or more things are similar in some respects they will likely be so in others. An experimentally produced flake scar is not analogous to a flake scar produced by an aboriginal craftsman. The relationship is that of identity in that the same fracture mechanics principles apply. To the extent that an experimental and a prehistoric scar exhibit a similar pattern of morphological characteristics, a similar force input can be assumed. Thus, the method simply involves finding the experimental flake scar in the experimental reference collection which most closely matches the morphological pattern on the prehistoric scar. In actual practice, it was my experience that there was never an identical 100% match of attributes and attribute states.

Therefore, there is often one or more possible alternative identifications for a prehistoric scar; the one with the most matching attributes is usually selected.

Still other concerns involve the amount of variation possible between flintknappers within a cultural group and the degree to which a specific production sequence can be assigned to a particular cultural group. One way to attempt to resolve this would be to conduct further experimental studies using a wide range of modern day craftsmen. We believe that craftsmen, trained by different flintknappers or self taught, will have their own identifiable production sequencing, problem solving and motor movement repertoires, as in the case of the striking differences observable in the Bonnichsen-Callahan experiments (Young & Bonnichsen 1984).

A further concern is the amount of attribute overlap between flake scar morphology which could lead to misidentification of flake scars. This problem clearly requires further experimental research on a variety of lithic materials, with an emphasis on refining the identification and measurement of specific attributes and attribute states. It also appears that for good scar identification, both at the experimental level and when identifying scars on prehistoric specimens, as complete a scar as possible is needed for a good identification. Truncated, overlapped and obviously failed scars should not be used in the analysis. This restricts the number of identifiable scars on prehistoric specimens and often only a few good ones are available for identification. This is why larger numbers of scars from each artifact were not analyzed in this dissertation. Once the experimental controls become more advanced it may be possible to develop a reference collection for failed scars and partial scars, allowing for analysis of a larger number of flake scars on each individual artifact.

Another cautionary note concerns potential criticism regarding the reliability of the behavior unit attributes and attribute states for flake scar identification as outlined in Table 16 of this thesis. The basis for discussing this problem can be drawn from Muto's (1971) pioneering work on technological analysis. Muto responded to a challenge regarding flake identification issued by Mewhinney (1957). Mewhinney had taken a skeptical approach postulating that twelve flakes which he had made could not be identified by others as to whether they were made with a wooden billet, a hammerstone or a modern steel hammer. After extensive experimentation, Muto (1971:119-20) was able to identify correctly only four of the twelve flakes, but was able to correctly identify seven out of twelve if only the criteria of hard and soft hammer was used.

Like Muto (1971:122), I must be careful to state that, while I have complete faith in my analysis, the experimental reference collection and the attributes developed for this study cannot necessarily be applied to other lithic materials, especially when it comes to the difficult matter of distinguishing hard and soft hammer percussion. Application to other situations would be complicated by the fact, as stated by Callahan (1980:18), that some antler billets are harder than a "soft" hammerstone.

In short, there is no easy universal answer to the problem of correct identification of manufacturing techniques from prehistoric specimens. Because the cognitive approach is processual and systematic and is based on a solid experimental base, I do feel however, that a high degree of successs in flake scar identification has been achieved for my particular study. Also, the method used in this thesis research, in contrast to earlier researchers such as Muto (who focused on flakes or debitage), concerns the remnant or negative scars left by the flakes on the artifact itself. This allows us to bring in contextual data from adjacent and other scars on the artifact, and also allows one to reconstruct the sequencing of technological production units. However, it is always possible that some unknown combination of behavior and tools could produce very similar morphological effects. Further application of the method with different craftsmen and different raw materials no doubt will, and should, lead to further refinements.

Yet another major problem remaining to be resolved involves the degree to which the technological data can be interpreted as cultural data. There is no doubt that all artifact analysis methods produce useful data at a descriptive level. However, making the very large step from description to cultural interpretation is a great deal more difficult. In the first chapter, I mentioned that I feel that a craftsman's production grammar is determined by a craftsman's social group or "culture" as flintknapping requires a lengthy learning and apprenticeship process. Although commonly employed behavior and production units are limited to a relatively small number (see Table 11) the possible combinations of these units that can be used to manufacture artifacts is extremely large. Experiments (Young & Bonnichsen 1984) have shown that craftsmen may tend to follow a rather rigorous sequencing of production units when manufacturing a particular functional class of artifact regardless of shape, and that once this particular process of producing and problem solving is learned it is followed and repeated by the craftsman. Thus, he may copy or 'create' a new shape of artifact but he will retain essentially the same basic production process. Thus, while the use of specific behavior units (i.e., billet versus hammerstone) by themselves may not be culturally specific, the way these units are applied, and especially their sequencing in the artifact creation process, may be a culturally influenced behavior.

Collins, in his 1973 paper "Lithic Technology as a Means of Processual Inference" (1973:12), supports our preceding arguments as indicated by the following statement:

> . . . The knapper is an enculturated member of a group. With his learning experience beginning early in life and continuing, perhaps intensively, over some years, a participant in a culture largely dependent upon its lithic technology will have the opportunity--or the necessity--to develop considerable skill. His skill may center around a relatively few techniques and a very limited array of raw materials. The present day experimental knapper with access to knowledge about a wide array of techniques and materials may develop a much greater repertory of skills and be able to shape a variety of kinds of stone, but it is unlikely that he will ever develop an acquaintance with specific materials as intimate as that achieved by a knapper that spends his entire life with a specific resource base.

Don Crabtree also thought that artifact production was a culturally influenced activity which should be studied at length. In a 1979 interview Crabtree (1979:33) states that, instead of basing typology on the shape one should study the surface treatment (technology), for "the surface treatment is the fingerprinting of the artistry and of the artisan that made it." Other flintknappers also agree. Jacques Pelegrin (1981:70), a French knapper, states that "the technological method of working flint is by itself a cultural pattern, one you may recognize with just two or three little scars, some grinding on this part or that and things like that."

Unfortunately, due to a lack of comparative data it is not possible in this thesis to conclusively demonstrate the cultural basis of production sequences. In order to establish some parameters of cultural differences in stone tool manufacturing, comparative data would be needed from a large number of sites that could be assigned to one or more specific cultures on the basis of other archaeological data. Also, it would be useful to analyze the same functional tool type (i.e., scrapers, bifaces, etc.) from a variety of sites to see if technology varies. In this regard, a paper by Clegg (1977:60) is instructive in that he feels that the above procedure will result in defining cultural data.

Errett Callahan also professes a desire to produce cultural data from technological data. Callahan (1979:23) states: "Because of my investigations into flake removal patterns, I maintain that differences in flake removal sequence, when consistently accompanied by other indicative features, may represent differing stages in time, space or lithic tradition."

In summary, I firmly believe that technological data can be transformed into useful cultural data, although, until additional sites are analyzed, this is difficult to demonstrate.

Finally, research conducted by Richard N. Dreiman on upper paleolithic burins is of relevance to our study. Dreiman (1979:2) concluded that "experiments in tool manufacture and utilization can be considered as reasonable replications of the probable activities of prehistoric man." I certainly agree with Dreiman (1979:4) that an archaeologist is obliged to learn to "read" stone tools in order to produce better typologies, to "investigate the limitations of the data, the validity of his analytical methods and the plausibility of his inferences."

Another concern related to the need to derive cultural information from stone tools involves studies of use-wear. It would be a logical progression to assign different use-wear patterns along with manufacturing technique to extra or intra-cultural differences. Unfortunately, the specimens under study in this thesis consist, to a large extent, of broken items (58%) and none appear to have been used as use-wear, although some natural wear from water is evident on some specimens. Although typology alone may not provide a high degree of cultural information, a sound typology can be used to help one ask the right questions of the data, and to help interpret other types of archaeological information. For example, a good typology can be used to separate mixed assemblages. If it can be shown that in the case of same shape and/or same use-wear, the tools are manufactured differently, one might well ask why? Possible considerations would then be whether or not two different groups are represented, or if only one group, whether the hafting method was different thereby requiring a different type of edge, etc. Some morphology normally identified as use-wear might also be due to a manufacturing technique.

Some researchers (e.g., Stevensen 1983:170-1) are currently suggesting that men and women made and used their own tool kits. In order to prove this suggested hypothesis, studies of both manufacturing technique and use-wear would be needed. A good understanding of stone tool manufacturing techniques is therefore, I suggest, a very useful prerequisite for successful use-wear studies.

A final thesis constraint, although applicable to all studies, is to realize when productive research degenerates into endless tinkering without making substantial progress. A second related problem is to realize that when working with theoretical constructs there is seldom any answer which is 100% correct and that the best resolutions involve the exploration of the range of logical possibilities rather than producing absolute certainties.

I believe that taking into consideration the concerns outlined, this thesis has developed the theoretical application of the cognitive process method to a point where a solid foundation has been created for further research.

Problems and Questions

Given the constraints mentioned, the results of the analysis can now be examined in terms of the six problem oriented questions posed at the beginning of this thesis.

The first and major question concerned the processual cognitive approach itself and hypothesized that the method could be used to demonstrate meaningful variation in the technological differences and/or similarities. Clearly, what is being tested here is a particular theoretical model, and as this is the first systematic application of the model's method and theory to a number of prehistoric artifacts, resolution of such a hypothesis is warranted before more specific problems can be addressed.

First, the method has been successful in demonstrating that there are demonstrable differences in the production grammars of the two sites. The Jordan site (DeHa-8) repertoire for biface manufacture (see Table 31) consists of face paring, utilizing indirect percussion, billet percussion and pressure, along with margin regularizing pressure thin and edge thickening pressure rub, all with the pressure flaker. In sharp contrast, the Jessup site repertoire for biface manufacture (Table 31) consists of face paring and margin moving hammerstone percussion, margin contouring minimal percussion thin with hammerstone and edge dulling rub buffet with hammerstone, margin contouring pressure thinning and edge regularizing shear shaping with the pressure flaker. The two sites not only differ in the basic behavior units used to remove flakes but also in the production units and the sequencing of units used to manufacture the artifacts. Although the writer feels that the evidence could lead to the definition of techno-types representing each site; due to the lack of comparative data (which severely restricts the answering of any broad regional questions at this time) I have not formalized the techno-types (see Chapter I) represented at the Jessup and Jordan sites. I believe additional collections need to be analyzed before such 'types' could be considered absolutely definitive or representative. Similarly, the definition of techno-patterns and techno-complexes would require analysis of several additional sites.

Secondly, the analysis has indicated the possible unreliability of outline shape, size, and size related standard metrical attribute data as cultural markers. Other researchers have also experienced this. Peter White, in his paper Ethno-Archaeology in New Guinea : Two Examples (1967:411), states that, "Highlands tools are not made to regular morphological (shape) patterns and therefore attempts to define types on the basis of tool shape is pretty unproductive." We do not argue the fact that certain shape/stylistic outline forms (i.e., Oxbow points) are good horizon markers in a temporal sense (no doubt, some shapes spread like a fad across extremely wide areas). For example, changes in the style of moccassins during the historic period spread widely across group boundaries with regularity every decade or two during the historic period (E. S. Rogers: personal communication). Thus, due to its rapid spread such outline forms as Oxbow points are excellent temporal markers or temporal index fossils but they are not necessarily suitable "to define" prehistoric cultures in the absence of other supportive evidence.

Although at this point the thesis approach (lacking comparative data) cannot indicate cultural affiliation, it has demonstrated a definitive resolution of artifact associations within each respective site and in the relationship of the two sites. This type of technological patterning, never before attempted, has produced an understanding of artifact manufacturing processes and resulting morphology far beyond that achieved by size, shape or metric (statistical) attribute analysis.

Due to a lack of comparative data, questions two to four are answered in terms of site specific data contained in this thesis, while questions five and six can be answered both in terms of the thesis results and through use of non-technological archaeological data presented in the thesis and/or discussed in Chapter IV.

Question two of the thesis concerned the significance of the extremely large bifaces (C01073 and C01071) from the Jordan site and asked whether they were part of the same technological assemblages as the smaller bifaces at the same site or whether they represented a different manufacturing technique (and a different group?). The analysis of these specimens clearly indicates that the large bifaces are not (as had been speculated) trade items or items from an entirely different component. One of the small bifaces (C01079), and to a lesser extent another (C01083) at the Jordan site, are almost identical to the large bifaces not only in terms of the specific production unit techniques used to remove flake scars but also in the specific sequence of these units in the manufacturing process.

In regards to the third question, which asked if there were any technological data to support the identification of the Jessup site as a lithic workshop site, the evidence is inconclusive. Possible preforms were represented in the analysis sample by two Jessup specimens (C02071, C02135) and one Jordan specimen (C01085). Jessup does have a predominance of hammerstone percussion and more margin moving and contouring behavior units and these may indicate a workshop situation, but lacking comparative data, no definitive statement can be made at this time.

The fourth question concerned whether or not the basic biface manufacturing techniques at the two sites were the same or different. A second part of the question asked if the differences or similarities were enough to ascertain if two similar or two different cultural groups are represented by the collections.

Four levels of analysis were used to answer the above question. The first level concerned shape and metric data, the second level involved behavior units, the third level production unit data and the fourth considered the sequencing of production units. Based only on the first level (Figure 15), it could be concluded that, on the basis of shape and size, the six convex based lanceolate bifaces from the two sites (three from each) are part of the same group. The large bifaces cannot be associated with any of the other artifacts on any basis and the bi-pointed ovoid bifaces can be assigned to the Jessup site. Proceeding from this initial analysis, the second and third levels involved the experimentally based identification of individual flake scars (Tables 18 and 59 - 69). Results of this analysis (Figure 16) indicates that, in contrast to the shape/metric analysis, the small Jordan bifaces are associated with the large Jordan bifaces and that the small Jessup bifaces could be separated from the small Jordan bifaces. Major differences in the production units used at each site were apparent (i.e., indirect percussion and billet at Jordan, hammerstone at Jessup) (Table 26). Two specimens were marginal (C02135 and C01085) and had strong inter-site connections. One specimen (C01067) did not have strong connections to any site at this level of analysis.

The fourth level of analysis (see Figure 19) produced the most distinctive and definitive results. This level analyzed the sequence of production units used to manufacture each artifact. It showed that the basic or 'core' production units from each site (Table 31) are totally different as are the sequencing of units used to manufacture each artifact. Other archaeological information (see Chapter II and IV) suggests that the Jordan site of unknown cultural affiliation may date to circa 7900 years B.P. and that possible relationships to the Caribou Lake complex of Manitoba should be investigated. The Jessup site alternatively, has been estimated to date between 5000 - 4000 years B.P. and has been assigned to the Abitibi Narrows phase of the Shield Archaic Tradition. Based on the technological evidence in this thesis I would suggest that the Jordan site belongs to either a late Paleo or an early undefined Archaic phase which may or may not evolve into the following Shield Archaic Tradition.

Question five arises from Hanna's (1980:71-2) suggestion that a very heavy reliance on percussion technology may be a diagnostic characteristic of the Shield Archaic linking the regional phases into a tradition. This, based on the thesis results, is a very interesting question. The Jessup site has been defined by several archaeologists as a Shield Archaic site with a Laurel component as well (see discussion, Chapter IV of this thesis). Comparative comments on the Jessup artifact technology are available from the work of two researchers, Thor Conway (1978), in a short paper, and Kritsch-Armstrong's M.A. thesis. These are examined here in the light of Hanna's hypothesis as well as the evidence from this thesis analysis.

Conway's description of 20 Jessup site artifacts produced the following pertinent conclusions in regards to the collection. First, he feels that linear bifacial knives (bifaces) are unique to the Jessup site but also states that further examples will be recognized as research continues. Conway states (1978:5) that "their noteworthy attributes include basal thinning, unintentional hafting notches and wear patterns on the convex side."

Kritsch-Armstrong's thesis, which concentrated on lithic technology at the Jessup site, utilized flakes and debitage for analysis and therefore the results are unfortunately not directly comparable to the approach used here.

Kritsch-Armstrong states that most of the Jessup artifacts were produced with hard hammer percussion, soft hammer and pressure flaking (with pressure flaking confined to two Laurel tools). The technological analysis was based largely on descriptive statistics derived from flake data (200 flakes) using 29 attributes and following the bulb analysis outlined by Muto (1971:77-78) as well as some uncontrolled experiments (Kritsch-Armstrong 1982:111). Some significant results included the high frequency of abraded platforms on the archaic flakes, and "bevelled-cluttered faceted platforms" on the archaic flakes, ". . . indicating there was considerably more concern with preparing platforms during bifacial reduction in the Archaic . . ." (Kritsch-Armstrong 1982:224-227). The basis of Kritsch-Armstrong's technological analysis, primarily comprising 29 non-experimentally derived attributes on flakes only, is quite different from the experimentally based attributes used in this thesis where the technological behavior behind the attribute has been strictly controlled. The research in this thesis has concentrated on the technological analysis of each flake scar on the finished prehistoric artifact rather than on the flake debitage as in Kritsch-Armstrong's study. Thus, the writer's study, rather than duplicating or replicating Kritsch-Armstong's work, provides a clear, alternative approach to technological analysis utilizing flake scars on actual artifacts rather than site debitage.

In her summary of the flake based technology, Kritsch-Armstrong compared the Laurel technology to the Shield Archaic technology based on flake samples assumed to be from one or other occupation areas at the site. One sample (Kritsch-Armstrong 1982:91) was drawn from an area associated with Laurel hearth features, while the other was drawn from an area of large bifacial tools designated as Archaic based on my definition of the Abibiti Narrows Phase of the Shield Archaic (Pollock 1976). While I have no doubt that there is a broad horizontal stratigraphy present at this site, one cannot in the final analysis be at all certain when dealing with a multi-component site that the debitage in any one area is either Laurel or Shield Archaic. Following her analysis, Kritsch-Armstrong (1982:240) came to the conclusion that there were technological differences represented in the debitage between the Laurel and Shield Archaic groups at Jessup. She states that the Shield Archaic peoples used soft hammer percussion, with abraded and cluttered faceted platforms, while the Laurel peoples used hard hammer and pressure flaking with plain or sparsely faceted platforms and platform strengthening. Importantly, she noted that the Laurel peoples used a greater amount of Hudson Bay Lowland chert and rhyolite quartzite materials which are not present at the Mt. Jessup quarry source.

In her conclusion, Kritsch-Armstrong (1982:257) states that there are more similarities than differences in the lithic manufacturing strategies of the Archaic and Laurel peoples and "the differences are more qualitative than absolute in light of the same techniques being used." She ends her comments with a statement that further research is needed. Because, as mentioned, the approach to the technological analysis of the specimens from this site is different between this thesis and Kritsch-Armstrong's, it is difficult to assess the different data sets and her conclusion. In contrast, I am fairly certain that the bifaces from this site are, in my analysis, related to the Shield Archaic, as no existing Laurel collections have bifaces morphologically similar to any of the bifaces analyzed here. Because of the use of debitage only, I believe the possibility of component mixture in Kritsch-Armstrong's flake debitage sample would have to be considered. Like Kritsch-Armstrong, my analysis indicates both hard hammer and soft hammer percussion are present at Jessup as are a number of platform preparation (dulling) and edge regularizing units which would produce faceted platforms, etc. However, these behavior units alone, as defined by Kritsch-Armstrong (level two of my analysis), are not at a diagnostic level and any comparison of technology at this level, especially one based on different attribute sets, is not apt to produce any results which could be considered definitive.

In a similar sense, Hanna's statement of percussion flaking as diagnostic of the Shield Archaic tradition is clearly at too low a level of technological resolution to be considered a definitive trait assignable to a specific culture. Indeed, the research in this thesis indicates that indirect percussion and pressure flaking as well as direct percussion flaking are present in at least one regional phase of the Shield Archaic tradition.

Question six concerned the Mt. Goldsmith Quarry site, the major methods of raw lithic extraction used, and the lack of finished tools at the quarry site itself. Although the research conducted at the quarry site did not in the end contribute any direct technological data to the thesis, the study of quarry sites is important to any technological research, as quarry sites represent the initial step of the tool making process.

The primary evidence of quarrying methods at the Mt. Goldsmith site indicates a heavy reliance on surface collecting and surface mining techniques such as collecting area five where a vertical face was mined. Archaeological excavation of a pit feature that was speculatively postulated as a shallow pit or shaft proved inconclusive. However, the possibility of some form of organized shallow audit mining along with the documented surface collecting and breakage cannot be ruled out entirely as many other pit features on the site have not been formally investigated and remain obscured by heavy overburden and debris.

In comparison to other quarry sites, notably the Rogers Quarry site in Quebec and the Mt. Jasper site in northern New Hampshire, there are no habitation sites in the immediate vicinity of the quarry, and the quarry itself contains few if any finished tools. These sites (including the Mt. Goldsmith Quarry), in addition to the absence of an on-site lithic workshop, contain a large amount of broken lithic material which is difficult to establish as being cultural in origin as it is not easy to distinguish natural breakage from human breakage in many cases.

Conclusion

From the results presented here, it is evident that use of individual flake scar analysis based on an experimentally derived cognitive technological approach can lead to an increase in our understanding of stone tool technology. It is hoped that by demonstrating the usefulness of the cognitive approach, this dissertation will stimulate additional research utilizing this method. There is a need to develop a body of comparative data in order to further explore the potential contribution of the cognitive approach to culture history studies.

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THE UNIVERSITY OF ALBERTA

A TECHNOLOGICAL ANALYSIS OF LAKE ABITIBI BIFACES

APPENDICES

Micro Vol II

by

John William Pollock

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
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APPENDIX 1. PRELIMINARY DESCRIPTION - JORDAN SITE BIFACES

Table 32: Description of All Archaeological Bifacial Specimens From the Jordan Site (DeHa-8)

Cat. No.	Description	No. Spec.	Metrics
C01056	biface fragment	1	fractured oval - dorsal and ventral faces secondary flaked and thin flaked - some retouching - 79.9 g - L. 11.8, W. 6.6, T. 1.2 cm
C01057	biface fragment	1	rectangular - dorsal and ventral faces secondary flaked, thin flaked and some retouching on three sides 21.2 g - L. 5.1, W. 3.9, T. 0.9 cm
C01058	biface fragment	1	fractured oval - dorsal face primary flaked, one side thin flaked and retouched - ventral face secondary flaked, two sides retouched - 89.5 g - L. 8.3, W. 5.4, T. 1.8 cm
C01059	biface fragment	1	dorsal face primary flaked, one side slightly retouched - ventral side secondary flaked, same side retouched - 40.6 g - L. 8.3, W. 3.3, T. 1.5 cm
C01060	biface fragment	1	dorsal face primary flaked, some chips removed from one edge ventral face fairly smooth but thin flaked - 12.6 g - L. 5.6, W. 2.2, T. 1.1 cm
C01061	biface fragment	1	dorsal face primary flaked, some thin flaking - ventral face secondary flaked, some thin flaking - 24.3 g - L. 4.8, W. 3.1, T. 1.1
C01062	biface fragment	1	dorsal face secondary flaked and thin flaked on all sides - ventral face smooth with two sides thin flaked - 10.3 g - L. 4.4, W. 3.9, T. 0.8 cm
C01063	biface fragment	1	dorsal face secondary flaked with retouching one side by nicking (chipping) ventral face secondary flaked one end fractured - 15.4 g - L. 5.5, W. 1.5, T. 0.7 cm

Table 32 continued.

Cat. No.	Description	No. Spec.	Metrics
C01064	biface fragment	1	ovoid fracture, dorsal and ventral faces secondary thin flaked - 70.0 g - L. 8.2, W. 5.6, T. 2.4 cm
C01066	bifacial chopper	1	dorsal and ventral faces secondary flaked, no primary flaking visible, all sides are thin flaked the majority done on the dorsal face - two longest opposing sides are blunted due to percussion against other rock material - 388.6 g - L. 12.3, W. 7.3, T. 3.0 cm
C01067	biface	1	dorsal and ventral faces secondary flaked, thin flaked on all sides, two sides thinner than the third which is also retouched more than the other two - little retouching on the ventral face - 107 g - L. 10.8, W. 6.6, T. 1.2 cm
C01068	biface	1	dorsal face secondary flaked, thin flaked on all sides except platform, retouching on sides but more so on one side which is also blunter - ventral face secondary flaked and thin flaked - 31.6 g - L. 6.7, W. 3.9, T. 1.0 cm
C01069	biface	1	dorsal face is primary flaked with some thin flaking - ventral face secondary flaked, hinge fracture - probably incomplete tool - 113 g - L. 9.8, W. 4.9, T. 2.4 cm
C01070	large biface	1	dorsal and ventral faces secondary flaked, thin flaked and some retouching on all sides - possible ovoid or lanceolate as it is fractured - 361.0 g - L. 18.2, W. 11.6, T. 1.7 cm
C01071	large biface	1	lanceolate - dorsal and ventral faces secondary flaked, thin flaked and some retouching on all sides - 647.3 g - L. 25.6, W. 11.2, T. 2.0 cm

Table 32 continued.

Cat. No.	Description	No. Spec.	Metrics
C01072	large biface	1	elongated lanceolate - dorsal and ventral faces secondary flaked, thin flaked and some retouching on all sides - 548.0 g - L. 28.9, W. 9.4, T. 1.9 cm
C01073	large biface	1	ovoid with stem - dorsal and ventral faces secondary flaked, thin flaked and some retouching on all sides - 559.6 g - L. 27.5, W. 10.4, T. 1.5 cm
C01074	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and retouched on all sides - 21.0 g - no platform L. 7.4, W. 4.0, T. 0.9 cm
C01075	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked with little retouching on all sides - distinct platform - 56.0 g - L. 9.7, W. 3.5, T. 1.3 cm
C01076	lanceolate biface	1	fractured probably during manufacture as it appears incomplete - is mainly primary flaking on dorsal face and light secondary flaking on ventral face - thin flaking not complete - 30.5 g - L. 7.3, W. 3.7, T. 1.2 cm
C01077	lanceolate bifaces	2	cemented together - dorsal and ventral faces secondary flaked, thin flaked with some retouching on all sides - 13.0 g - L. 5.6, W. 2.4, T. 0.7 cm
C01078	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and retouched on all sides - 36.7 g - L. 8.7, W. 4.0, T. 1.1 cm
C01079	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and retouched on all sides - 43.4 g - L. 10.2, W. 4.2, T. 1.1 cm

Table 32 continued.

Cat. No.	Description	No. Spec.	Metrics
C01080	lanceolate biface	1	dorsal and ventral faces secondary flaked, ventral more so, thin flaked and retouched on all sides - 41.5 g- L. 9.5, W. 2.7, T. 1.1 cm
C01081	lanceolate biface	2	not completed due to fracture and bad thin flaking - 2 sections cemented together - large platform - dorsal and ventral faces show secondary flaking - thin flaked on all sides - 37.0 g - L. 9.3, W. 3.6, T. 1.1 cm
C01082	lanceolate biface	1	not completed due to fracture - platform still present - rough thin flaking - 35.2 g - L. 6.9, W. 3.8, T. 1.2 cm
C01083	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked some retouching on all sides - 53.8 g - L. 10.3, W. 4.8, T. 1.3 cm
C01084	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and retouched on all sides - 35 g - L. 8.8, W. 4.1, T. 1.0 cm
C01085	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and retouched on all sides - 64.6 g - L. 11.0, W. 5.0, T. 1.2 cm
C01086	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and extensively retouched on all sides - 33.4 g - L. 8.7, W. 4.0, T. 1.0 cm
C01087	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and retouched on all sides - 25.7 g - L. 8.0, W. 3.6, T. 1.9 cm
C01088	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and retouched on all sides - 26.0 g - L. 7.2, W. 3.8, T. 1.0 cm

Table 32 continued.

Cat. No.	Description	No. Spec.	Metrics
C01089	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and extensively retouched - 24.4 g - L. 7.1, W. 3.6, T. 1.6 cm
C01090	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and some retouching on all sides - 12.0 g - L. 7.2, W. 3.6, T. 0.7 cm
C01091	lanceolate biface	1	dorsal and ventral faces secondary flaked, thin flaked and some retouching on all sides - 27.8 g - L. 7.3, W. 3.3, T. 1.1 cm
C01092	stemmed biface	1	fractured tip - dorsal and ventral faces secondary flaked, thin flaked with little retouching on sides - base notched out to form neck - 38.1 g - L. 8.3, W. 3.9, T. 1.0 cm
C01093	stemmed biface	1	dorsal and ventral faces secondary flaked, thin flaked with some retouching on two sides - base is notched out to form neck - 9.0 g - L. 5.4, W. 2.8, T. 0.6 cm
C01094	lanceolate biface preform	1	dorsal face secondary flaked, thin flaked, and some retouching on sides ventral face smooth except few flakes removed - tip fractured - 24.2 g - L. 6.4, W. 3.8, T. 0.9 cm
C01095	lanceolate biface preform	1	dorsal and ventral faces secondary flaked with some thin flaking - needs more flaking to get a sharper edge - 26.0 g - L. 6.4, W. 3.5, T. 1.2 cm
C01096	lanceolate biface preform	1	dorsal and ventral faces secondary flaked - needs more thin flaking for completion - 10.9 g - L. 5.1, W. 2.6, T. 0.8 cm

Table 32 continued.

Cat. No.	Description	No. Spec.	Metrics
C01097	lanceolate biface fragment	1	upper half with tip - dorsal and ventral faces secondary flaked, thin flaked with little retouching - 14.0 g - L. 4.7, W. 3.4, T. 0.8 cm
C01098	lanceolate biface fragment	1	mid section or possibly just missing tip - dorsal and ventral faces secondary flaked and thin flaked on two sides - 15.6 g - L. 3.9, W. 3.8, T. 0.8 cm

APPENDIX 2. PRELIMINARY DESCRIPTION - JESSUP SITE BIFACES

Table 33: Metric Description of All Archaeological Bifacial Specimens From the Jessup Site (DdGw-2)

Cat. No.	Description	No. Spec.	Metrics
C02500	biface	1	possible initial reduction stage for narrow black bifaces with pronounced convex bases. L. 12.51, W. 5.18, T. 2.93 cm
C02091	biface	1	possible initial reduction stage for narrow black bifaces with pronounced convex bases. L. 11.61, W. 5.34, T. 2.61 cm
C02556	biface	1	possible initial reduction stage for narrow black bifaces with pronounced convex bases. L. 9.68, W. 5.08, T. 2.45 cm
	biface	1	broad blade expanding to moderately rounded (convex base) - rounded corners - assymetrical. L. 8.57, W. 4.83, T. 2.48 cm
C02558	biface	1	broad blade expanding to moderately rounded (convex base) - rounded corners - assymetrical. L. 9.80, W. 5.12, T. 2.30 cm
	biface	1	broad blade expanding to moderately rounded (convex base) - rounded corners - assymetrical - base unfinished. L. 10.48, W. 5.64, T. 3.26 cm
C02333	biface	1	narrow blade tapering to a pronounced convex base - broken. L. 7.44, W. 4.75, T. 1.90 cm
C02349	biface	1	narrow blade tapering to a pronounced convex base - broken. L. 9.96, W. 5.09, T. 1.85 cm
C02554	biface	1	incomplete bifacial flaking - thick and comparatively "crude" - essentially broad bladed tapering to a pronounced convex base - broken. L. 7.75, W. 4.66, T. 2.05 cm

Table 33 continued.

Cat. No.	Description	No. Spec.	Metrics
C02318	biface	1	narrow blade with moderately convex base - broken. L. 7.54, W. 4.15, T. 1.66 cm
C02191	biface	1	broad blade with broad shallow convex base - rounded shoulder incomplete bif. flaking. Unifacial secondary flake removal uni-lat. & dist. - poss. post breakage - alternate usage as a scraper blank - broken. L. 8.34, W. 5.29, T. 1.63 cm
C02177	biface	1	broad blade with broad, moderately convex base - broken. L. 4.02, W. 5.94, T. 1.60 cm
C02185	biface	1	broad blade with broad, moderately convex base - broken. L. 8.04, W. 5.57, T. 1.52 cm
C02146	biface	1	broad blade tapering to broad flat to slightly convex base with rounded corners. L. 12.48, W. 6.06, T. 1.40 cm
C02510	biface	1	broad blade tapering to broad straight to slightly convex base. L. 12.22, W. 6.38, T. 1.68 cm
C02170	biface	1	broad blade tapering to broad straight to slightly convex base. L. 6.77, W. 5.90, T. 1.91 cm
C02193	biface	1	broad blade tapering to broad straight to shallow convex base with rounded corners - slightly ground lateral edges - prob. for platform preparation - broken. L. 7.69, W. 5.61, T. 1.35 cm
C02350	biface	1	broad blade tapering to broad straight to shallow convex base - broken. L. 9.13, W. 4.96, T. 1.86 cm

Table 33 continued.

Cat. No.	Description	No. Spec.	Metrics
C02088	biface	1	broad blade tapering to broad straight to shallow convex base with rounded edges. L. 9.55, W. 4.63, T. 2.03 cm
C02134	biface	1	broad blade tapering to broad straight to shallow convex base with rounded edges - incomplete bifacial flaking on flake blank. L. 7.80, W. 4.45, T. 1.64 cm
C02365	biface	1	narrow blade tapering to a straight base with rounded corners L. 8.58, W. 3.70, T. 1.50 cm
C02072	biface	1	narrow blade tapering to pronounced rounded base. L. 8.10, W. 3.45, T. 1.20 cm
C02362	biface	1	narrow blade tapering to pronounced rounded (convex) base - incomplete bif. flaking - base unfinished. L. 8.21, W. 3.80, T. 1.90 cm
C02099	biface	1	narrow blade tapering to a rounded base. L. 7.0, W. 3.12, T. 1.24 cm
C02135	biface	1	narrow blade tapering to pronounced rounded base - similar form to 5-A. L. 10.28, W. 3.50, T. 1.72 cm
C02080	biface	1	broad blade with broad pronounced rounded base - incomplete bifacial flaking. L. 10.20, W. 4.92, T. 1.59 cm
C02075	biface	1	broad blade with broad rounded base. L. 8.51, W. 4.28, T. 1.52 cm
C02076	biface	1	broad blade with broad rounded base - may represent unused scraper preform or cutting tool with natural backed edge. L. 8.46, W. 4.06, T. 1.50 cm

Table 33 continued.

Cat. No.	Description	No. Spec.	Metrics
C02373	biface	1	incomplete bifacial flaking - narrow blade, rounded pronounced (convex) base - proximal end missing - broken. L. 8.04, W. 3.98, T. 1.21 cm
C02179	biface	1	base not thinned - original striking platform still present - narrow blade - pronounced rounded (convex) base - proximal end missing - broken. L. 5.61, W. 4.05, T. 1.25 cm
C02163	biface	1	narrow blade, pronounced rounded (convex) base - proximal end missing - broken. L. 6.34, W. 4.19, T. .95 cm
C02164	biface	1	narrow blade, pronounced rounded (convex) base - proximal end missing - broken. L. 5.22, W. 3.66, T. .84 cm
C02289	biface	1	narrow blade with pronounced rounded (convex) base - proximal end missing - broken. L. 6.76, W. 3.69, T. 1.06 cm
C02295	biface	1	narrow blade tapering to pronounced rounded (convex) base - broken. L. 7.26, W. 4.05, T. 1.12 cm
C02145	biface	1	narrow blade - base missing - broken. L. 9.59, W. 3.75, T. 1.01 cm
C02555	biface	1	biface tip.
C02264	biface	1	narrow blade.
C02142	biface	1	basal section missing.
C02268			
C02167	biface	1	basal section, narrow blade, tapering to pronounced rounded (convex) base - broken. L. 5.45, W. 4.13, T. .90 cm

Table 33 continued.

Cat. No.	Description	No. Spec.	Metrics
C02081	biface	1	short, broad bladed biface with broad but pronounced rounded (convex) base. L. 6.78, W. 4.74, T. 1.15 cm
C02074	biface	1	short, broad bladed biface with broad but pronounced rounded base (convex). L. 7.54, W. 4.23, T. 1.10 cm
C02176	biface	1	short, broad bladed biface with broad but pronounced rounded base (convex) - broken. L. 6.64, W. 5.0, T. 1.03 cm
C02330	biface	1	short, broad bladed biface with broad but pronounced rounded base (convex) - broken. L. 6.60, W. 5.50, T. 1.41 cm
C02183	biface	1	broad blade with broad pronounced rounded base - incomplete bif. flaking - broken. L. 7.19, W. 4.91, T. .90 cm
C02341	biface	1	broad blade with broad pronounced rounded base - incomplete bif. flaking - broken. L. 8.67, T. 1.47 cm
C02077	biface	1	broad blade with broad but pronounced rounded base. L. 9.76, W. 4.80, T. 1.36 cm
C02079	biface	1	broad blade with broad but pronounced rounded base - incomplete bif. flaking. L. 10.77, W. 4.44, T. 1.56 cm
C02186	biface	1	broad blade with broad rounded base - broken. L. 5.32, W. 5.09, T. 1.04 cm
C02325	biface	1	broad blade with broad but shallow to straight base with rounded corners - broken. L. 4.45, W. 4.14, T. .86 cm

Table 33 continued.

Cat. No.	Description	No. Spec.	Metrics
C02174	biface	1	broad blade with broad but shallow to straight base with rounded corners - broken. L. 5.81, W. 3.94, T. .84 cm
C02322	biface	1	broad blade with broad but shallow to straight base with rounded corners - broken. L. 6.98, W. 4.06, T. 1.13 cm
C02187	biface	1	broad blade with broad but shallow to straight base with rounded corners - broken. L. 6.36, W. 4.35, T. 1.35 cm
C02313	biface	1	broad blade with broad but shallow to straight base with rounded corners - two pieces. L. 7.06, W. 3.86, T. .74 cm
C02359	biface	1	broad blade with broad but shallow to straight base with rounded corners - two pieces. L. 9.64, W. 4.06, T. 1.30 cm
C02173	biface	1	broad blade with broad but shallow to straight base with rounded corners - broken - incomplete bif. flaking. L. 8.90, W. 5.64, T. 1.03 cm
C02071	biface	1	broad blade with broad but shallow convex base - no basal thinning, poss. striking platform from flake preform still present - two pieces. L. 10.88, W. 4.72, T. 1.54 cm
C02082	biface	1	two sections - glued - narrow blade tapering to pronounced rounded (convex) base. L. 13.70, W. 3.63, T. 1.19 cm
C02096	biface	1	two sections - glued - narrow blade tapering to base - base less convex than above. L. 8.75, W. 3.37, T. .98 cm

Table 33 continued.

Cat. No.	Description	No. Spec.	Metrics
C02357	biface	1	narrow blade tapering to pronounced rounded (convex) base - biface on hinged flake preform - incomplete bifacial flaking. L. 10.78, W. 3.66, T. 1.30 cm
C02364	biface	1	narrow blade tapering to pronounced rounded (convex) base - pronounced step fractures unilat. - unsuccessful attempt to thin medial ridge of biface. L. 9.15, W. 3.20, T. 1.17 cm
C02263	biface	1	narrow blade tapering to pronounced rounded (convex) base - poss. crude collateral flaking on one face - broken - proximal end missing. L. 7.40, W. 3.54, T. 1.19 cm
C02363	biface	1	assymetrical biface - narrow blade tapering to moderately rounded base L. 7.80, W. 2.90, T. .88 cm
C02069	biface	1	biface on hinged flake blank - narrow blade with moderately rounded base - incomplete bifacial flaking. L. 7.43, W. 3.20, T. 1.03 cm
C02070	biface	1	broad blade with broad but shallow convex to straight base with rounded corners. L. 9.31, W. 4.24, T. .94 cm
C02169	biface	1	broad blade with broad but shallow convex to straight base with rounded corners. L. 10.53, W. 4.38, T. 1.41 cm
C02166	biface	1	broad blade with broad but shallow convex to straight base with rounded corners - tip not finished - biface generally assymetrical in form. L. 12.58, W. 4.80, T. .99 cm
C02068	biface	1	broad blade tapering to fairly broad slightly convex base. L. 8.05, W. 3.82, T. .86 cm

Table 33 continued.

Cat. No.	Description	No. Spec.	Metrics
C02173	biface	1	broad based thin biface basal section - broken - base shallow convex-rounded - incomplete bifacial flaking - step fractured distally - unsuccessful basal thinning - broken. L. 8.90, W. 5.64, T. 1.03 cm
C02330	biface	1	broad based refined bif. - broken - base shallow convex-rounded - complete bif. flaking. L. 6.60, W. 5.50, T. 1.41 cm
C02193 Stage 3	biface	1	broad based thin biface - broken - base shallow convex-rounded - complete bif. flaking - lat. edges ground - platform prep. L. 7.69, W. 5.61, T. 1.35 cm
C02186	biface	1	broad based - shallow convex base - broken - complete bif. flaking. L. 5.32, W. 5.09, T. 1.04 cm
C02176	biface	1	refined biface basal section - broken - base broad but pronounced round (convex). L. 6.64, W. 5.0, T. 1.03 cm
C02183	biface	1	refined biface basal section - broken - base broad with a more pronounced convexity- rounding - incomplete bif. flaking. L. 7.19, W. 4.91, T. .90 cm
C02081	biface	1	short broad based biface - pronounced convex base - possibly reworked from larger broken biface - complete bifacial flaking. L. 6.78, W. 4.74, T. 1.15 cm
C02077	biface	1	broad based with rounded pronounced convex base - complete bifacial flaking - two sections. L. 9.76, W. 4.80, T. 1.36 cm
C02072	biface	1	complete preform - rounded (convex) base - no second retouch. L. 8.10, W. 3.45, T. 1.20 cm

Table 33 continued.

Cat. No.	Description	No. Spec.	Metrics
C02359	biface	1	two pieces - slight bilat. retouch - probably edge preparation - straight base - rounded corners. L. 9.64, W. 4.06, T. 1.30 cm
C02075	biface	1	crude biface preform - complete rounded (convex) base - slight second retouch - prob. edge preparation. L. 851, W. 4.28, T. 1.52 cm
C02365	biface	1	straight base - refined except for mass near base. L. 8.58, W. 3.70, T. 1.50 cm
C02135	biface	1	broken - two pieces - refined except for mass in centre at break - rounded base, some retouch. L. 10.28, W. 3.50, T. 1.72 cm
C02362	biface	1	base unfinished - incomplete bifacial flaking. L. 8.21, W. 3.80, T. 1.90 cm
C02099	biface	1	rounded base - small unfinished preform. L. 7.0, W. 3.12, T. 1.24 cm
C02085	biface	1	straight base - thin preform. L. 8.83, W. 3.80, T. .97 cm
C02084	biface	1	unfinished base - platform still on base from initial removal of flake on which biface was manufactured. L. 7.60, W. 4.0, T. .94 cm
C02169	biface	1	complete bifacial flaking - light second retouch bi-lat. and distally - shallow convex base. L. 10.53, W. 4.38, T. 1.41 cm
C02070	biface	1	complete bifacial flaking - light second retouch bi-lat. and dist. - shallow but more pronounced convex base. L. 9.31, W. 4.24, T. .94 cm

Table 33 continued.

Cat. No.	Description	No. Spec.	Metrics
C02074	biface	1	complete bif. flaking - light second retouch bi-lat. & dist. - pronounced rounded (convex) base. L. 7.54, W. 4.23, T. 1.10 cm
C02138	biface	1	incomplete unifacial flaking on dorsal surface - light retouch distal and uni-lat. edges. L. 8.03, W. 4.53, T. 1.40 cm
C02185	biface	1	primarily unifacial flaking - dorsal surface - partially flaked on ventral face - thin - step flakes removed - broken. L. 7.26, W. 4.45, T. 1.61 cm
C02140	biface	1	complete flaking dorsal surface - incomplete flaking ventral surface - marked bi-lateral stepping - rounded base. L. 6.93, W. 3.24, T. .59 cm
C02076	biface	1	light retouch distally & unilaterally - other lateral edge unmodified - too thick for effective reduction - naturally backed edge? L. 8.46, W. 4.06, T. 1.50 cm
C02555	biface	1	tip section of refined biface. L. 5.64, W. 3.30, T. .93 cm
C02100	biface	1	in two sections, snapped bi-lat. - prob. straight base, however, basal edge removed accidentally during thinning process. L. 9.10, W. 3.93, T. 1.20 cm
C02357	biface	1	biface on hinged flake preform - incomplete bifacial flaking - rounded base (convex) no retouch. L. 10.78, W. 3.66, T. 1.30 cm
C02096	biface	1	in two sections - snapped bi-lat. - straight base - rounded edges - slight bi-lat. secondary retouch. L. 8.75, W. 3.37, T. .908 cm

Table 33 continued.

Cat. No.	Description	No. Spec.	Metrics
C02068	biface	1	refined biface - slightly convex base - some bi-lat. second retouch. L. 8.05, W. 3.82, T. .900 cm
C02069	biface	1	bifacially flaked preform - no retouch - on a hinged flake blank - slightly convex base - some secondary retouch. L. 7.43, W. 3.20, T. 1.03 cm
C02082	biface	1	in two sections - snapped bi-lat. rounded (convex) base - bi-lat. step fractures either from thinning or edge preparation. L. 13.70, W. 3.63, T. 1.19 cm
C02929	biface	1	bifacially flaked biface - in two sections - secondary retouch unifacially at distal end - poss. intended re-use of broken section as a scraper - very slight use-wear - rounded base. L. 9.32, W. 4.26, T. .903 cm
C02363	biface	1	rounded base assymetrical biface - no secondary retouch - tip broken L. 7.80, W. 2.90, T. .808 cm
C02364	biface	1	rounded base - no retouch. L. 9.15, W. 3.20, T. 1.17 cm
C02163	biface	1	narrow pronounced convex based biface - basal section - refined biface - broken. L. 6.36, W. 4.14, T. .90 cm
C02263	biface	1	narrow with pronounced convex base - complete bi-facial flaking - crude collateral flaking on one face - broken. L. 7.40, W. 3.54, T. 1.19 cm
C02289	biface	1	narrow with pronounced rounded convex base - complete bif. flaking.
C02080	biface	1	biface preform incomplete bif. flaking rounded base. L. 10.20, W. 4.92, T. 1.59 cm

APPENDIX 3. EXPERIMENTAL VIDEOTAPE SCRIPT

Table 34: Abstracted Script of Lithic Experiments, Videotape V-22-04-001

Introduction

30 John Pollock introducing the experiment.

285 Young talking about experiment research design. First Rob will make preforms. They will be dyed white. Then Rob will apply the units that they isolated in looking at the collection of Lake Abitibi artifacts. They will be photographed. Third stage will be taking preforms and applying one unit at a time to a preform.

Raw Material Evaluation

643 Rob on tape discussing what he is going to do, physical qualities of rock.

Making Preforms

947 Buffeting edge with granite hammerstone.
984 Hits rock, it splits. (Hard to hear talking).
1040 Striking again.
1066 Takes smaller hammerstone, striking off small edges sticking out.
1130 Using larger hammerstone to try to take off a larger flake. Angle is not right, he adjusts how he's holding rock. Gets a flake. Says rock is very grainy, hard to work.
1228 Continues to strike.
1248 Gets another nice flake.
1285 Striking again. Gets some crushing.
1300 Clearing area of crushing, results in remaining core being a "good slab."
1347 Doing shaping on slab with small granitic hammerstone. It breaks in half due to flaw of iron precipitate in centre. Continues shaping now smaller piece.
1433 It splits in half lengthwise.
1454 He continues to shape. Running into more problems due to material. Decides to stop and move to some larger pieces.
1540 Shaping a rough piece with small hammerstone.
1684 Changes to a billet. Says if he had a choice of materials he would throw this piece away. Changes to billet because it will distribute force over a wider area, maybe not shatter as much.
1777 He says he's setting up platforms.
1792 Says now billet is too light, won't deliver enough energy, changes back to hammerstone.
1850 Trimming off a lump.
1865 Abrading edge with hammerstone.
1880 Changes back to billet. Takes off a flake.
1904 Getting rid of thin sharp edge.
1927 Taking off short shaping flakes.
2060 Material breaks. He shows flaw to camera. Did get a thinning flake.
2140 Shaping another flake with a small sandstone pebble.
2160 Sound problem.

Table 34 continued.

2183	Continues to shape.
2260	Thinning thick edge.
2290	Also trying to center the edge more.
2345	Abrading edge.
2354	Changing to caribou antler billet (it's harder than other antler).
2370	Gets a flake where he wanted.
2380	Continues to flake. Says his edge is a little too thin so he's taking off a series of short flakes to center it.
2400	Abrading edge with hammerstone. He grinds because if edge is real thin when you strike it will crush.
2419	Striking with billet.
2437	Edge grinding. He says this isn't just grinding, takes a few flakes off too (hammerstone moved vertically across edge).
2455	Striking with billet.
2494	Dulling edge with hammerstone.
2520	Gets nice flake.
2540	Edge grinding.
2550	Flaking with billet.
2555	Straightening edge with small hammerstone, says it's sort of a combination of flaking and grinding.
2584	Strikes with billet, gets a flake.
2634	Trimming flakes with billet to get a convex face.
2720	Taking off minimal thinning flakes, trying to get convex surface.
2760	Abrading edge.
2775	Thinning flakes with billet.
2850	Sound problem.
2903	Trimming with hammerstone on new flake. Wants to take off a bunch of short flakes.
3012	Continues flaking with hammerstone after discussion on why hammerstone instead of billet.
3070	It breaks in half. He says he hit it too hard, shocked it.
3106	Continues to thin and shape one of the broken halves.
3130	Changes to large billet, striking off thinning flakes to get rid of a few lumps.
3143	Abrading edge with billet to make sure edge is strong.
3150	Strikes, gets flake.
3169	Changes back to hammerstone.
3226	Striking with billet
3251	Cleaning edge up with small hammerstone.
3262	Abrading edge with hammerstone.
3270	Striking with billet.
3331	Using hammerstone to get rid of sharp little surfaces on edge.
3345	Striking with billet.
3366	Using small hammerstone to strike flakes.
3402	Got a sort of step fracture.
3431	Moving to experiment #4, early stage preforming.
3450	Striking large chunk with large hammerstone.
3480	Discussing undulations in rock.
3499	Setting up platforms.
3535	Changes to smaller hammerstone.
3547	Still trying to split off one ridge.
3580	Trimming edge with small hammerstone.

Table 34 continued.

3596	Strikes with large hammerstone, it splits because he had too big a mass. It split lengthwise, will continue with one piece.
3620	Break in tape.
3630	Starts with Rob holding large core that he's taking flakes off with large hammerstone.
3813	Using smaller hammerstone to set up platform.
3826	Using larger hammerstone to remove flakes.
3838	Using small hammerstone on edge.
3855	Using large hammerstone to take off flakes.
3869	Showing pile of flakes that they've just taken off.
3903	Rob appears to be filing a pressure flaker.

Start of Experiments

(This section from here to 4719 is out of place. Should be after point 5327)

3938	This section of tape is out of order, should be somewhere at end of recordings. It's part of Experiment #7.
3942	AB16-7. Moderate percussion thin with hammerstone.
3975	AB11. Indirect percussion Experiment - from 3975 to 4719. Young says this is the end of the basic experiments in terms of units that they've analyzed before. Now are going to experiment with a new unit that they've never recorded before, the punch technique.
4017	Rob grinding edge so he'll have a more solid place to work from.
4042	Rob says punch techniques are awkward, hard to use, stand a good chance of breaking the end of your punch.
4065	Holding small antler punch on edge of preform, striking end of it with antler billet.
4108	Showing model artifact, shows what they are trying to get.
4130	Indirect percussion with billet as punch. Gets nice flat flake, what they wanted.
4175	Decide to call this experiment #11.
4202	Abrading edge of preform.
4215	Doing indirect percussion with billet as punch on other face.
4265	Abrading edge.
4285	Doing indirect percussion with billet, gets little flake.
4310	Beveling edge with hammerstone.
4329	Doing indirect percussion with billet. Gets little flake.
4351	Does it again.
4380	Trimming edge with hammerstone.
4390	Does indirect percussion with billet again.
4410	Same thing again.
4432	Same thing again.
4460	Rob wants to try it on obsidian.
4467	Abrading edge of obsidian preform.
4490	Doing indirect percussion with billet. Gets flake. Says it looks like a pressure flaker flake.
4538	Doing it again using small antler punch. Works better to use as lever.

Table 34 continued.

4570 Doing same thing again.
4599 Rob says it's pure tension, no compression.
4622 Doing indirect percussion with billet held sideways as lever and preform held by his shoe.
4658 Trimming edge with billet using direct percussion.
4682 Doing indirect with billet, preform held by shoe again.

4719 AB10-1. Cut to Rob abrading edge of white painted preform.
4785 AB10-1. Abrading edge of preform with side of antler billet.

4838 AB2-2. Pressure rub with tip of pressure flaker. Rob says he doesn't really like the word rub because this is a unidirectional movement, rub implies two directions.
4900 AB2-2. Doing platform isolation with tip of pressure flaker. It is actually doing three different things. Middle one is edge rub, where he's just cleaning it up a little.
4990 AB2-2. Doing abrading of edge with hammerstone.

5019 AB9-5. Minimal pressure thinning/beveling with pressure flaker.
5049 Other side. Moderate pressure thin with pressure flaker. (They just said "This is still experiment #5).

5098 AB8-6. Experiment #6 - substantial pressure thin with pressure flaker.
5155 Holding up artifact to see flake scars. Says they look like moderate even though substantial force was applied.
5183 Doing platform preparation, edge rub with tip of pressure flaker.
5197 Shearing with edge of pressure flaker.
5202 Substantial pressure thinning with pressure flaker. Not really successful.

5242 AB5-9. Minimal percussion thinning with the billet.
5284 AB5-9. No sound at first. He's doing percussion thinning to other edge.

5327 AB7-10. No sound at first. Substantial percussion thinning with billet.

N.B. Break in continuity. Return to point 3942 for AB16-7 and AB11.

5407 No sound. He's doing something with pressure flaker to edge, taking off projections, not thinning.

5443 AB13-15. Says they're "still on experiment #15." Moderate pressure shaping with the pressure flaker. This is what he usually uses almost exclusively for notching. It's an attempt to remove a fair amount of material straight down, not to thin. He breaks tip of pressure flaker.
5466 AB13-15. Switches to copper tipped pressure flaker. Doing moderate pressure shaping on base.

Table 34 continued.

5488	Experiment AB14-16. Minimal percussion shape with hammerstone.
5511	Other edge, moderate percussion shaping with the hammerstone.
5542	Experiment AB3-17. Substantial percussion shaping with the hammerstone.
5565	Experiment AB15-18. Minimal percussion shaping with the billet.
5592	Experiment AB15-18. Other edge, moderate percussion shaping with the billet.
5613	Experiment AB12-19. Substantial percussion shaping with the billet.
5640	Experiment AB6-13. Minimal shear shaping with the pressure flaker. Decide it was really moderate. Hard to do with antler, switches to copper tool min-mod to maximum-minimal on other side.
5679	End of cassette.

APPENDIX 4. EXPERIMENTAL SPECIMENS

Table 35: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number:

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) Drawing(s) Artifact(s)

1.5 Photographic Plate Identification Number:

1.6 Video Tape Reel Identification Number:

2.0 Description of Experiment:

2.1 Extent of Effect:

2.2 Type of Behavior:

2.3 Tool Used:

2.4 Total Flake Scars on Specimen:

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal			
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge			
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent or rare			
2.2.2 light			
2.2.3 heavy			
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light			
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			
2.4.1 straight			

2.4.2 U shaped notch

2.4.3 flat curved notch

2.4.4 convex projections

2.4.5 other

3.0 FLAKE SCAR PROFILE ATTRIBUTES

3.1 PERCUSSION BULB

3.1.1 not applicable

3.1.2 indistinct

3.1.3 distinct

3.2 TRANSITION ANGLE

3.2.1 not applicable

3.2.2 gradual rise

3.2.3 steep rise

3.3 FLAKE THICKNESS

3.3.1 not applicable

3.3.2 thin

3.3.3 thick

4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES

4.1 RIBS

4.1.1 absent

4.1.2 limited

4.1.3 moderate

4.1.4 extensive

4.1.5 very extensive

4.2 DISTINCTIVENESS/RIBS

4.2.1 not applicable

4.2.2 indistinct

4.2.3 moderately distinct

4.2.4 pronounced

4.2.5 variable

4.3 RIB SPACING

4.3.1 not applicable

4.3.2 far apt. evenly dist.

4.3.3 far apt. on dist. half

4.3.4 close, evenly dist.

4.3.5 close, on dist. half

4.3.6 variable

4.4 TEARING

4.4.1 absent

4.4.2 light

4.4.3 heavy

5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES

5.1 SCAR SHAPE DIST. EDGE

5.1.1 straight dist. edge

5.1.2 rounded dist. edge

5.1.3 irregular dist. edge

5.2 SCAR TERMINATION

5.2.1 feather

5.2.2 step

Table 36: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB10-1 (Side A)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 3 A4 #35

1.6 Video Tape Reel Identification Number: V-22-04-001 - footage 4719

2.0 Description of Experiment:

Experiment AB10-1 involved the edge buffet with a hammerstone using minimal force in a working direction from the tip of the preform to the base along the left lateral margin as shown in diagram (Side A). The edge is blunted or rounded so that it will not crush when used as a platform for removal of flakes. An alternative purpose would be to smooth the edge after removal of flakes (Nicholas & Bonnichsen n.d.:10-11).

2.1 Extent of Effect: minimal - 2

2.2 Type of Behavior: rub buffet - 12 (edge - dulling)

2.3 Tool Used: hammerstone - 41

2.4 Total Flake Scars on Specimen: 4

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal	X	all	100%
1.1.2 minimal			
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge			
2.1.2 intermediate edge	X	all	100%
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent or rare			
2.2.2 light			
2.2.3 heavy	X	1,2,3,4	100%
2.3 MICROFLAKES			
2.3.1 absent	X	all	100%
2.3.2 light			
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			
2.4.1 straight			

2.4.2 U shaped notch			
2.4.3 flat curved notch			
2.4.4 convex projections	X	(follows original edge)	
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable	X	all	100%
3.1.2 indistinct			
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable	X	all	100%
3.2.2 gradual rise			
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable	X	all	100%
3.3.2 thin			
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X	all	100%

4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X	all	100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X	all	100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge		24	50%
5.1.2 rounded dist. edge		3	25%
5.1.3 irregular dist. edge		1	25%
5.2 SCAR TERMINATION			
5.2.1 feather	X	1,3	50%
5.2.2 step	X	2,4	50%

Table 37: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB10-1 (Side B)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 3 A4 #35

1.6 Video Tape Reel Identification Number: V-22-04-001 - footage 4785

2.0 Description of Experiment:

Minimal edge buffet with side of antler billet working in a direction from the base of the specimen towards the tip along the right lateral margin as shown in Figure (Side B). This experiment involves dragging the flat side of an antler across the edge of the artifact.

2.1 Extent of Effect: minimal - 2

2.2 Type of Behavior: rub buffet - 12 (edge - dulling)

2.3 Tool Used: hammerstone - 41

2.4 Total Flake Scars on Specimen: 4

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal	X	all	100%
1.1.2 minimal			
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge			
2.1.2 intermediate edge	X	2,3	15.38%
2.1.3 dull edge	X	1,7-8,9-13	84.61%
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light	X	2,10	15.38%
2.2.3 heavy			
2.3 MICROFLAKES			
2.3.1 absent	0		
2.3.2 light	X	2,3	15.38%
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			
2.4.1 straight			

2.4.2 U shaped notch			
2.4.3 flat curved notch			
2.4.4 convex projections			
2.4.5 other	X (follows existing or original edge)		
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	2,3	15.38%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	2,3	15.38%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	all	100%
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X		
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X		

4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X		
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X		
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge			
5.1.2 rounded dist. edge			
5.1.3 irregular dist. edge	X	all	100%
5.2 SCAR TERMINATION			
5.2.1 feather	X	1-2,4-13	92.31%
5.2.2 step	X	3	7.69%

EXPERIMENT AB 10-1

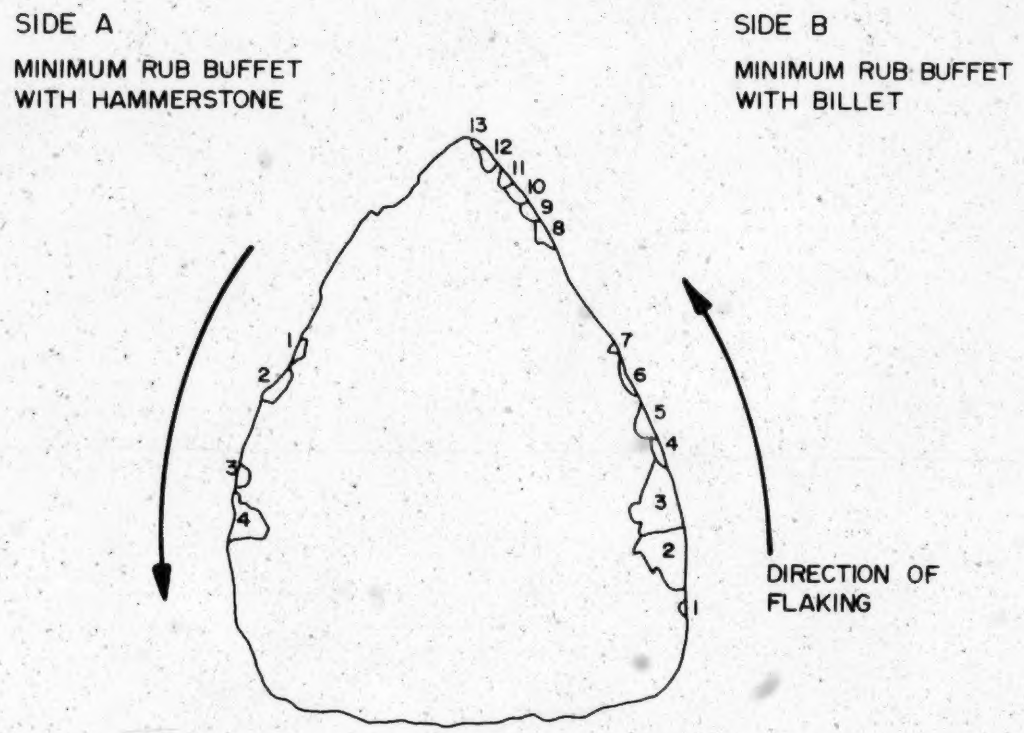

SIDE A
MINIMUM RUB BUFFET
WITH HAMMERSTONE
SIDE B
MINIMUM RUB BUFFET
WITH BILLET
13
12
11
10
9
8
1
2
3
4
7
6
5
4
3
2
1
DIRECTION OF
FLAKING

Figure 20: Line drawing of specimen AB10-1.

0 5 10 20mm

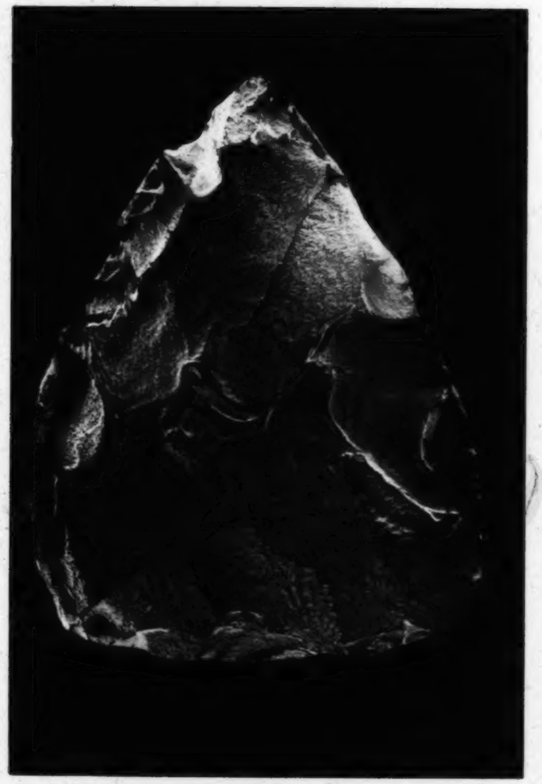


Plate 31: Photograph of Experimental Specimen AB10-1.

Table 38: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB2-2 (Side A)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 2, A2, 14a

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Edge abrading with hammerstone along the left lateral margin with a back and forth movement (videotape footage at 4990). The experiment involves rubbing the edge of the artifact with a back and forth movement parallel to the edge using an abrasive tool such as a hammerstone.

2.1 Extent of Effect: minimal - 1

2.2 Type of Behavior: rub abrade - 11

2.3 Tool Used: hammerstone - 41

2.4 Total Flake Scars on Specimen: no scars present

2.5 Attributes on the following coding form are taken from Table 13:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal	X	all	100%
1.1.2 minimal			
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge			
2.1.2 intermediate edge			
2.1.3 dull edge	X	all	100%
2.2 MARGIN DAMAGE			
2.2.1 absent	X	all	extensive grinding
2.2.2 light			
2.2.3 heavy			
2.3 MICROFLAKES			
2.3.1 absent	X	all	100%
2.3.2 light			
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			

2.4.1 straight	X	all	100% follows existing edge
2.4.2 U shaped notch			
2.4.3 flat curved notch			
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable	X	all	100%
3.1.2 indistinct			
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable	X	all	100%
3.2.2 gradual rise			
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable	X	all	100%
3.3.2 thin			
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			

4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X	all	100%
4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X	all	100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X	all	100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge			only produced
5.1.2 rounded dist. edge	X	3	a few extremely
5.1.3 irregular dist. edge			small scars
5.2 SCAR TERMINATION			
5.2.1 feather	X	all	100%
5.2.2 step			

Table 39: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB2-2 (Side B)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) Drawing(s) Artifact(s)

1.5 Photographic Plate Identification Number: Roll 2, A2, 14a

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Uni-directional pressure rub with pressure flaker in one direction only (videotape 4838) a pressure rub involves rubbing across the edge with the tip of a pointed tool such as a pressure flaker, usually the artifact is held flat so that the pressure rub can be applied downward (Nicholas & Bonnichsen n.d.:28).

2.1 Extent of Effect: minimal - 2

2.2 Type of Behavior: pressure rub - 32

2.3 Tool Used: antler pressure flaker - 31

2.4 Total Flake Scars on Specimen: scars 1 to 5 (on Figure)

2.5 Attributes on the following coding form are taken from Table 14:

N.B. Rounded scars seem to be associated with feather terminations and straight scars with step terminations.

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute, State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal	X	1-5	100%
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all 6	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light			
2.2.3 heavy	X	all 6	100%
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light			
2.3.3 heavy	X	all 6	100%
2.4 PROX. EDGE MORPH.			
2.4.1 straight			

2.4.2 U shaped notch	X	2	16.66%
2.4.3 flat curved notch			
2.4.4 convex projections	X	1,3,4,5,6	83.33%
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	all	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	all	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	all	100%
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X	all	100%

4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X	all	100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X	all	100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	3,5,6	50%
5.1.2 rounded dist. edge	X	1,2,4	50%
5.1.3 irregular dist. edge			
5.2 SCAR TERMINATION			
5.2.1 feather	X	3,5,6	50%
5.2.2 step	X	1,2,4	50%

Table 40: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB2-2 (Side C)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 2, A2, 14a

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Platform isolating with pressure rub using the tip of an antler pressure flaker (see videotape 4900). Platform isolating consists of removing material on both sides of the platform in order to better control the direction of force and the shape of the resulting flake (Nicholas & Bonnichsen n.d.:12).

2.1 Extent of Effect: minimal (?) - 2

2.2 Type of Behavior: pressure rub / platform isolating - 13

2.3 Tool Used: antler pressure flaker - 31

2.4 Total Flake Scars on Specimen: scars 7-12, total 7

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal	X	7,9,12,13	57.14%
1.1.2 minimal	X	8,10,11	42.85%
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent or rare			
2.2.2 light			
2.2.3 heavy	X	7,8,10, 11,12,13	85.71%
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light	X	7,8,11	42.85%
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			

2.4.1 straight			
2.4.2 U shaped notch	X	6,7,8,10, 11,12,13	85.71%
2.4.3 flat curved notch			
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	all	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	all	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	all	100%
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			

4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X	all	100%
4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X	all	100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent			
4.4.2 light	X	10	14.28%
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge		8,9,10,11,12	71.42%
5.1.2 rounded dist. edge		13	14.28%
5.1.3 irregular dist. edge		7	14.28%
5.2 SCAR TERMINATION			
5.2.1 feather		7,8	28.57%
5.2.2 step		9,10,11,12,13	71.42%

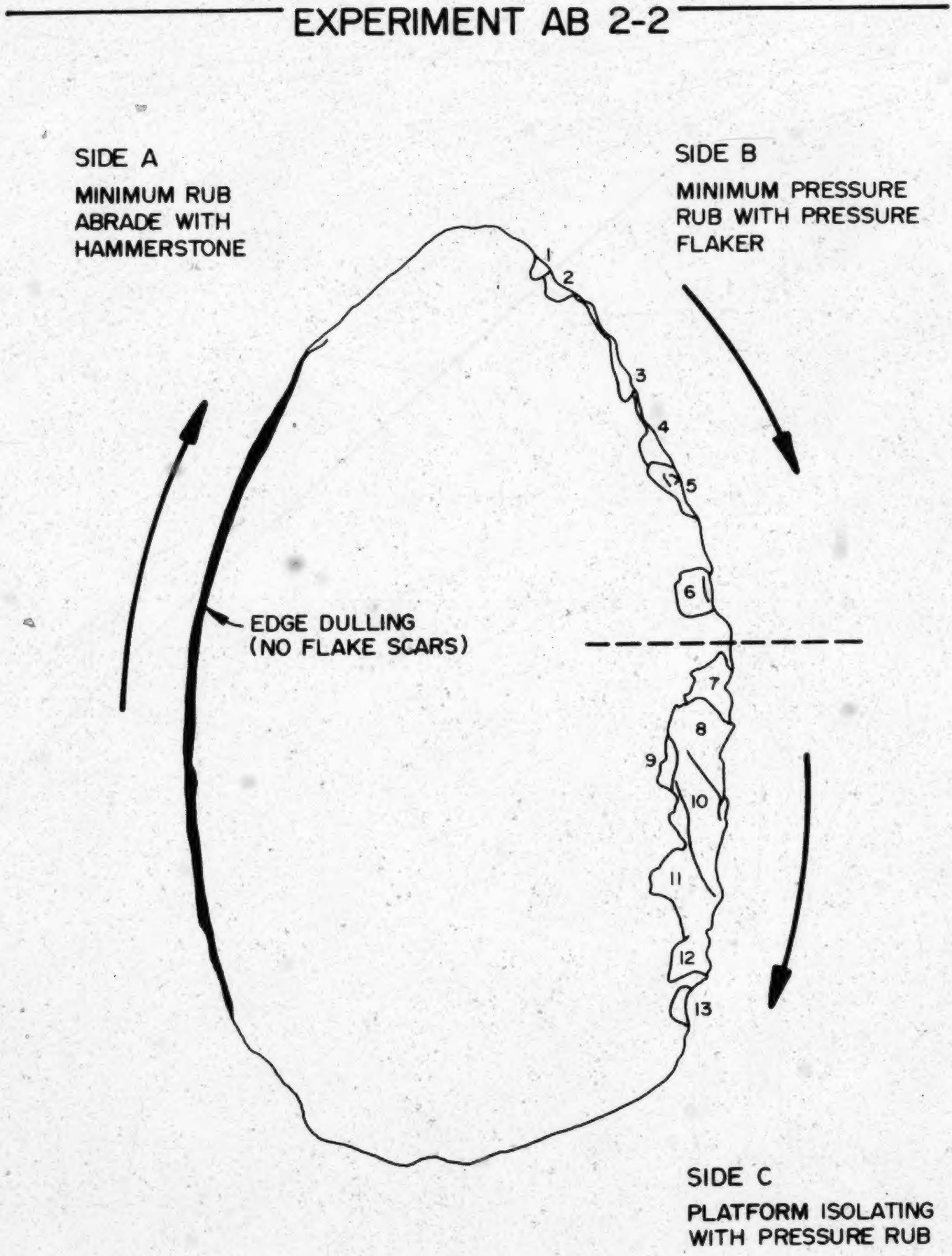

EXPERIMENT AB 2-2
SIDE A
MINIMUM RUB
ABRADE WITH
HAMMERSTONE
SIDE B
MINIMUM PRESSURE
RUB WITH PRESSURE
FLAKER
EDGE DULLING
(NO FLAKE SCARS)
1
2
3
4
5
6
7
8
9
10
11
12
13
SIDE C
PLATFORM ISOLATING
WITH PRESSURE RUB

Figure 21: Line drawing of specimen AB2-2.

Plate 32: Photograph of Experimental Specimen AB2-2.

Table 41: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB9-5 (Side A)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 3, A3, #7

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Moderate pressure thinning/bevelling with antler pressure flaker (left lateral side) (videotape 5019-5049). Pressure is the type of force that occurs when the tip of the pointed tool is set on the edge of the artifact and then pushed either inward or downward with increasing force. Pressure thinning involves the removal of flakes from the underside of the artifact and thins the artifact more rapidly than the margins are moved in (Nicholas & Bonnichsen n.d.:28).

2.1 Extent of Effect: moderate - 3

2.2 Type of Behavior: pressure thin - 31

2.3 Tool Used: antler pressure flaker - 31

2.4 Total Flake Scars on Specimen: 9

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal	X	1,2,4	33.3%
1.1.3 moderate	X	3,5,6,7,8,9	66.6%
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent	X	1,4	22.2%
2.2.2 light			
2.2.3 heavy			
2.3 MICROFLAKES			
2.3.1 absent	X		100%
2.3.2 light			
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			
2.4.1 straight			

2.4.2 U shaped notch	X	3,4,5,6,7,8,9	77.7%
2.4.3 flat curved notch	X	1,2	22.2% failed scars
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	all	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	all	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	all	100%
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	3,8	22.2%
4.1.2 limited			only visible
4.1.3 moderate			by rotating
4.1.4 extensive			specimen at
4.1.5 very extensive			an angle in strong light

4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable			
4.2.2 indistinct	X	3,8	22.8%
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable			
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half	X	3,8	22.2%
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X	all	100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	2,4,6,8,9	55.6%
5.1.2 rounded dist. edge	X	3	11.1%
5.1.3 irregular dist. edge	X	1,5,7	33.3%
5.2 SCAR TERMINATION			
5.2.1 feather	X	1,2,3,4,6,7,8	77.8%
5.2.2 step	X	5,9	22.2% (due to preform)

Table 42: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB9-5 (Side B)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 3, A3, #7

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Minimum pressure thin with pressure flaker (right lateral side) (videotape 5019-5049).

2.1 Extent of Effect: minimum

2.2 Type of Behavior: pressure thin

2.3 Tool Used: antler pressure flaker

2.4 Total Flake Scars on Specimen: 12 (one isolated interior scar not counted)

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal		9,12	16.6%
1.1.2 minimal		1,2,3,4,7, 8,10,11	66.6%
1.1.3 moderate		5,6	16.6%
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light	X	1,2	16.6%
2.2.3 heavy			
2.3 MICROFLAKES			
2.3.1 absent	X	all	100%
2.3.2 light			
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			

2.4.1 straight			
2.4.2 U shaped notch	X	all	100%
2.4.3 flat curved notch			
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	all	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	all	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	all	100%
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent			
4.1.2 limited	X	5,6,7	25%
4.1.3 moderate			do not put
4.1.4 extensive			on master
4.1.5 very extensive			chart

4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable			
4.2.2 indistinct	X	5,6,7	25%
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable			
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half	X	5,6,7	25%
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X	all	100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge		2,6,8,9, 10,11,12	58.3%
5.1.2 rounded dist. edge			
5.1.3 irregular dist. edge		1,3,4,5,7	41.7%
5.2 SCAR TERMINATION			
5.2.1 feather	X	3,5,7,8,11	41.6%
5.2.2 step	X	1,2,4,6,9, 10,12	58.4% (some failed scars)

EXPERIMENT AB 9-5

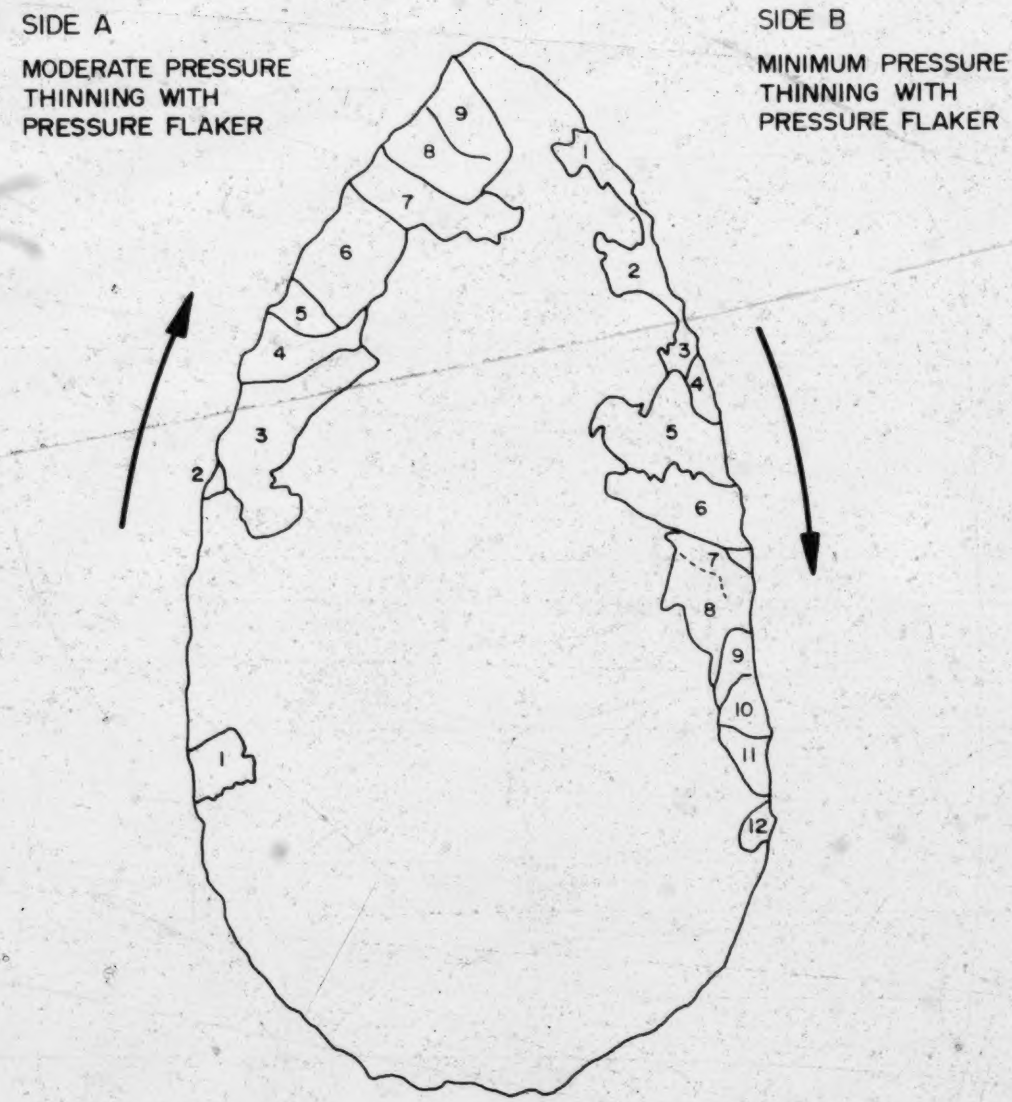
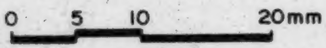

SIDE A
MODERATE PRESSURE THINNING WITH PRESSURE FLAKER
SIDE B
MINIMUM PRESSURE THINNING WITH PRESSURE FLAKER
1
2
3
4
5
6
7
8
9
1
2
3
4
5
6
7
8
9
10
11
12

Figure 22: Line drawing of specimen AB9-5.



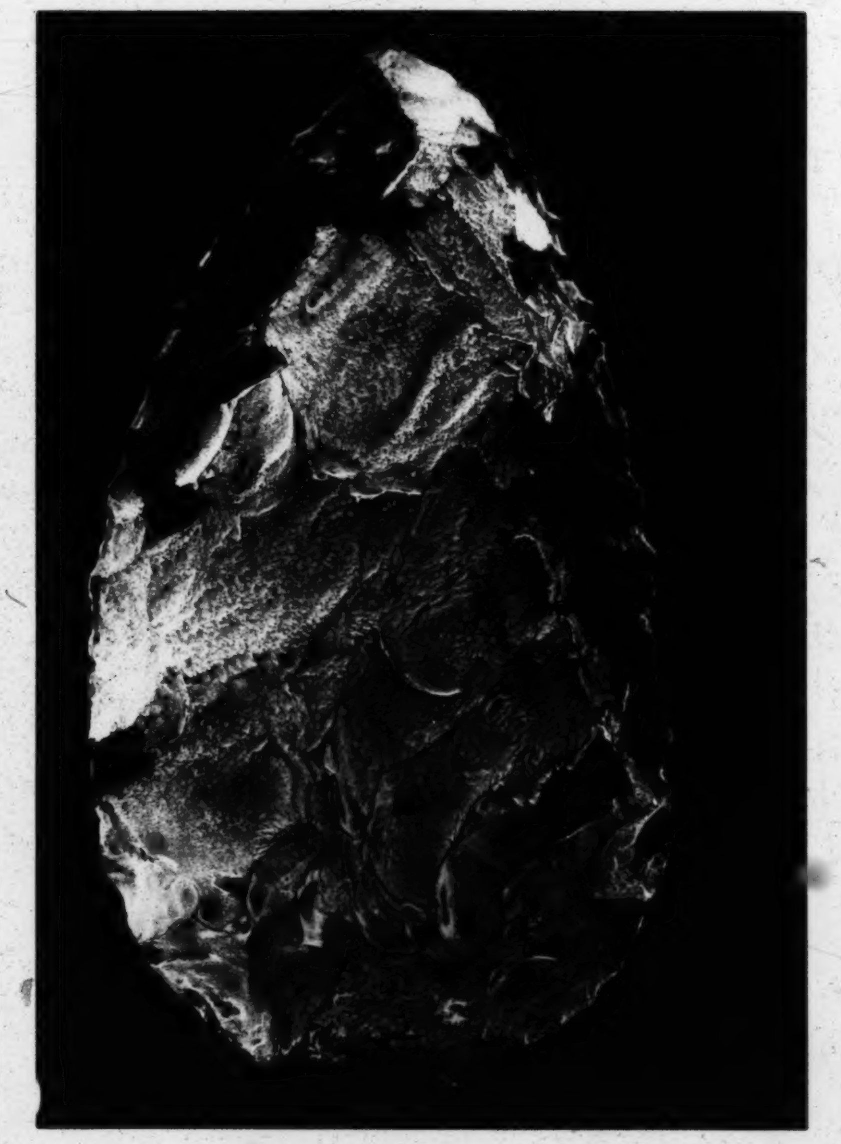


Plate 33: Photograph of Experimental Specimen AB9-5.

Table 43: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB16-7(a)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 3, A3, #1

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Moderate percussion thinning with a hammerstone. Side A (left lateral margin) has a large number of failed scars (i.e., failed platforms, etc.) (videotape 3942' to 3975'). Percussion flaking consists of a series of rapid blows to the edge of the artifact with a hammerstone or other percussor. The intent is to thin the specimen not move in or regularize the artifact edge.

2.1 Extent of Effect: moderate 3

2.2 Type of Behavior: percussion thin - 41

2.3 Tool Used: hammerstone - 41

2.4 Total Flake Scars on Specimen: 5 (selected from both sides; see drawing)

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR [illegible]			
1.1.1 very minimal			
1.1.2 minimal			
1.1.3 moderate	X	1,3,5	60%
1.1.4 substantial	X	24	40%
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent	0	X	not much on selected scars
2.2.2 light			(failed scars have a lot of edge
2.2.3 heavy			damage)
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light	X	2,4	40%
2.3.3 heavy			

2.4 PROX. EDGE MORPH.			
2.4.1 straight			
2.4.2 U shaped notch			
2.4.3 flat curved notch	X	1,2,4,5	100% as platform for
2.4.4 convex projections			#3 has been destroyed
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	all	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	all	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	1,2,3,5	80%
3.3.3 thick	X	4	20%
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent			
4.1.2 limited			all difficult to see,
4.1.3 moderate			(may be some terracing or

4.1.4 extensive	X	1,3,4,5(?)	planes in lithic
4.1.5 very extensive			material effect)
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable			
4.2.2 indistinct	X	all	?
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable			
4.3.2 far apt. evenly dist.	X	all	?
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent			
4.4.2 light	X	2,4	40%
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	1,3,4,		60%
5.1.2 rounded dist. edge	2,5		40%
5.1.3 irregular dist. edge			predominantly straight on failed scars

5.2 SCAR TERMINATION

5.2.1 feather	1,2	40%
5.2.2 step	3,4,5	60% predominantly step on failed scars

Table 44: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB16-7(B)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s)

1.5 Photographic Plate Identification Number: Roll 3, A3 - #1

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Minimum percussion thinning with a hammerstone. Flakes selected from both sides of artifact (see drawing) (videotape 3942 to 3975).

2.1 Extent of Effect: minimal

2.2 Type of Behavior: percussion thin

2.3 Tool Used: hammerstone

2.4 Total Flake Scars on Specimen: 6 (selected from both sides - see drawing)

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal	X	all	100%
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light			
2.2.3 heavy	X	1,3,5,6	66%
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light			
2.3.3 heavy	X	1,3,5	50%
2.4 PROX. EDGE MORPH.			
2.4.1 straight	X	2,4,6	50%

2.4.2 U shaped notch			
2.4.3 flat curved notch			
2.4.4 convex projections	X	1,3,5	50%
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	all	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	all	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	all	100%
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X	all	100%

4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X	all	100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X	all	100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	2,4,5	50%
5.1.2 rounded dist. edge	X	1,3,6	50%
5.1.3 irregular dist. edge			
5.2 SCAR TERMINATION			
5.2.1 feather	X	1	16.6%
5.2.2 step	X	2,3,4,5,6	83.3%

EXPERIMENT AB 16-7

1. MINIMUM PERCUSSION THIN WITH HAMMERSTONE (SCARS MARKED Mi-1, etc.)
2. MODERATE PERCUSSION THIN WITH HAMMERSTONE (SCARS MARKED Mo1, etc.)

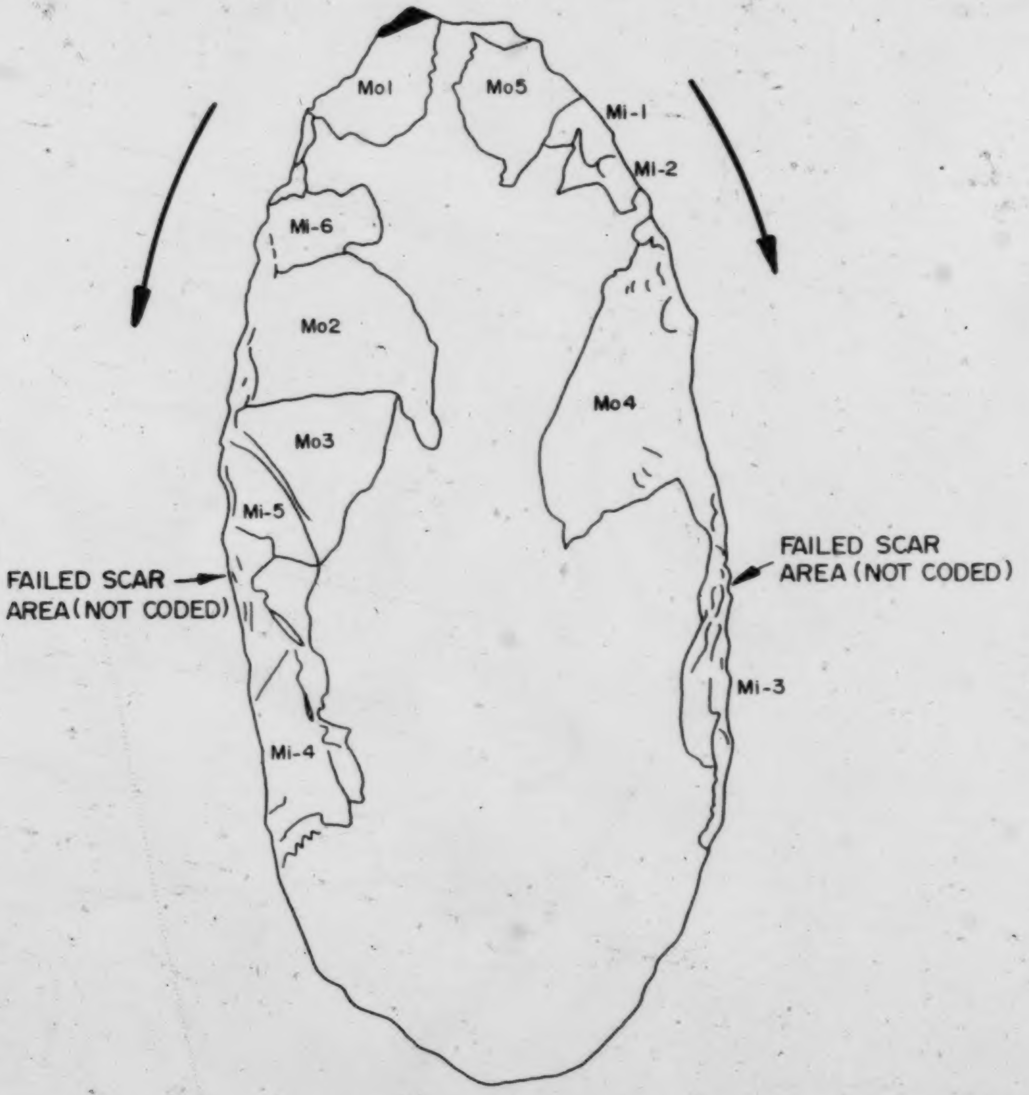
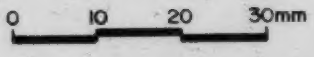

Mo1
Mo5
Mi-1
Mi-2
Mi-6
Mo2
Mo4
Mo3
Mi-5
FAILED SCAR AREA (NOT CODED)
FAILED SCAR AREA (NOT CODED)
Mi-3
Mi-4

Figure 23: Line drawing of specimen AB16-7.



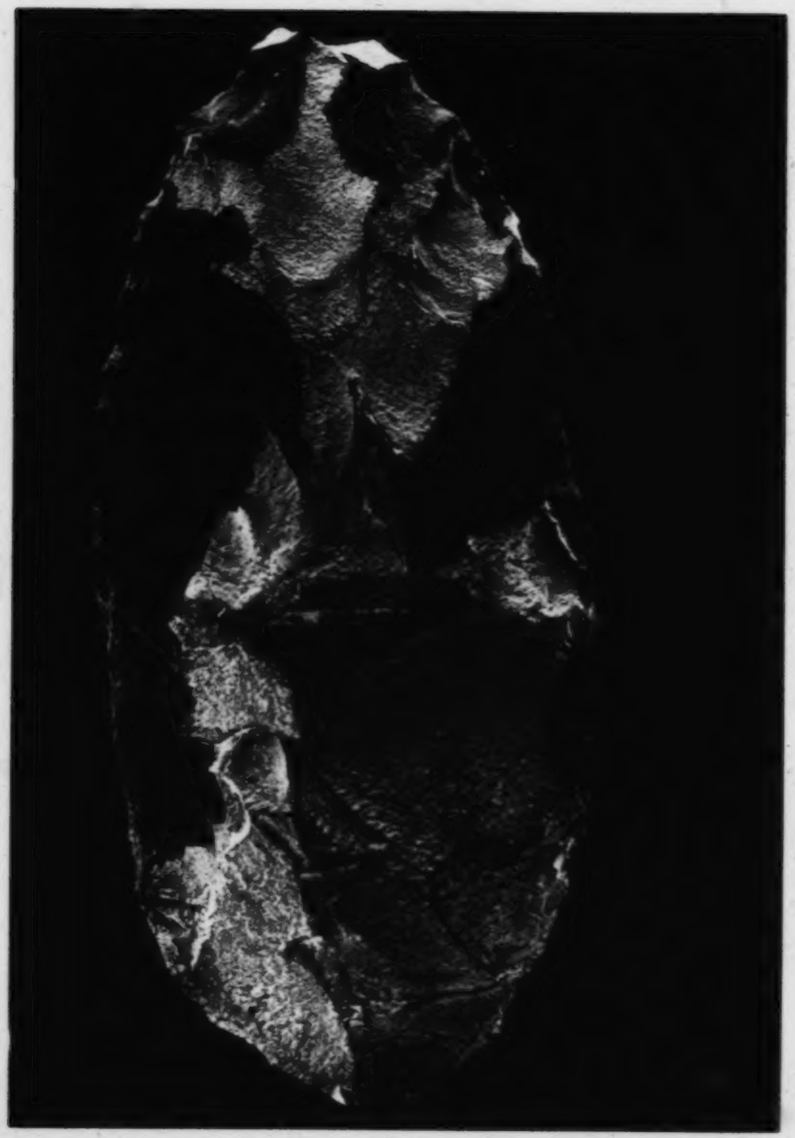


Plate 34: Photograph of Experimental Specimen AB16-7.

Table 45: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB5-9 (right margin) (Side B)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 2, A2 #8A

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Moderate percussion thinning with an antler billet. Scars on the right lateral margin of the flaked face were used (videotape 5242-5327). Percussion flaking involves the use of fairly rapid blows to the edge of the artifact with an antler billet. The object is to thin material from the artifact face rather than to move in or regularize the edge. Minimum percussion flaking either hard or soft hammer does not seem productive for this purpose (see note below).

2.1 Extent of Effect: moderate - 3

2.2 Type of Behavior: percussion thin - 41

2.3 Tool Used: billet - 51

2.4 Total Flake Scars on Specimen: 5 used (8 failed or overlapped scars not used)

2.5 Attributes on the following coding form are taken from Table 14:

N.B.

As with the minimum percussion thin with hammerstone (experiment AB16-7), the minimum percussion thin with a billet was also generally unsatisfactory. Minimal effects in both cases produced platform crushing, extensive hinge fracturing, and small stepped flake terminations which are difficult to tell apart. This being the case, minimal percussion may not have been extensively used by prehistoric peoples utilizing this material.

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal			
1.1.3 moderate	X	4,5	40%
1.1.4 substantial	X	1,2,3	60%
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light	X	8,4,5	60% (failed scars have heavy margin damage)
2.2.3 heavy			
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light	X	4,5	40%
2.3.3 heavy			

2.4 PROX. EDGE MORPH.			
2.4.1 straight			
2.4.2 U shaped notch			
2.4.3 flat curved notch	X	1,2,3,4	80% (100%)
2.4.4 convex projections			#5 destroyed
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	1,2,3,5	80%
3.1.3 distinct	X	4	20%
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	1,2,3,5	80%
3.2.3 steep rise	X	4	20%
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	1,2,3,5	80%
3.3.3 thick	X	4	20%
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent			
4.1.2 limited	X	1,2	20%
4.1.3 moderate			

N.B. The best flake examples have a distinct percussion bulb with a steep rise and a curved flake scar bottom with indistinct ribs relatively far apart in distal half.

4.1.4 extensive			
4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable			
4.2.2 indistinct	X	1,2	20%
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable			
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half	X	1,2	20%
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent			
4.4.2 light	X	1	20%
4.4.3 heavy			(very indistinct)
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	1,3,5	60%
5.1.2 rounded dist. edge	X	24	40%
5.1.3 irregular dist. edge			
5.2 SCAR TERMINATION			
5.2.1 feather	X	1,4,2	50%

5.2.2	step	X	3,5,2	50% #2 has feather and step both

Table 46: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB5-9 left margin (Side A)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s)

1.5 Photographic Plate Identification Number: Roll 2, A2, #8a

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Minimal percussion thinning with an antler billet scars on the left lateral margin (Side A) were used (videotape 5242-5327).

2.1 Extent of Effect: minimal - 2

2.2 Type of Behavior: percussion thin - 41

2.3 Tool Used: billet - 51

2.4 Total Flake Scars on Specimen: 9 used

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal	X	all	77.8%
1.1.3 moderate	X	5,2	22.2%
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light			
2.2.3 heavy	X	all	100%
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light			
2.3.3 heavy	X	all	100%
2.4 PROX. EDGE MORPH.			
2.4.1 straight			

2.4.2 U shaped notch			
2.4.3 flat curved notch			
2.4.4 convex projections	X	all	100%
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	all	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	all	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin		1,2,4-9	88.9%
3.3.3 thick		#3	11.1% (this is a failed scar)
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			

4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X	all	100%
4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X	all	100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent			
4.4.2 light	X	4	11.1% (this scar is more mod. than min.)
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge		2,3	22.2%
5.1.2 rounded dist. edge		4,6,9	33.33%
5.1.3 irregular dist. edge		1,5,7,8	44.4%
5.2 SCAR TERMINATION			
5.2.1 feather		4,6,7,8,9	55.5%
5.2.2 step		1,2,3,5	44.4%

EXPERIMENT AB 5-9

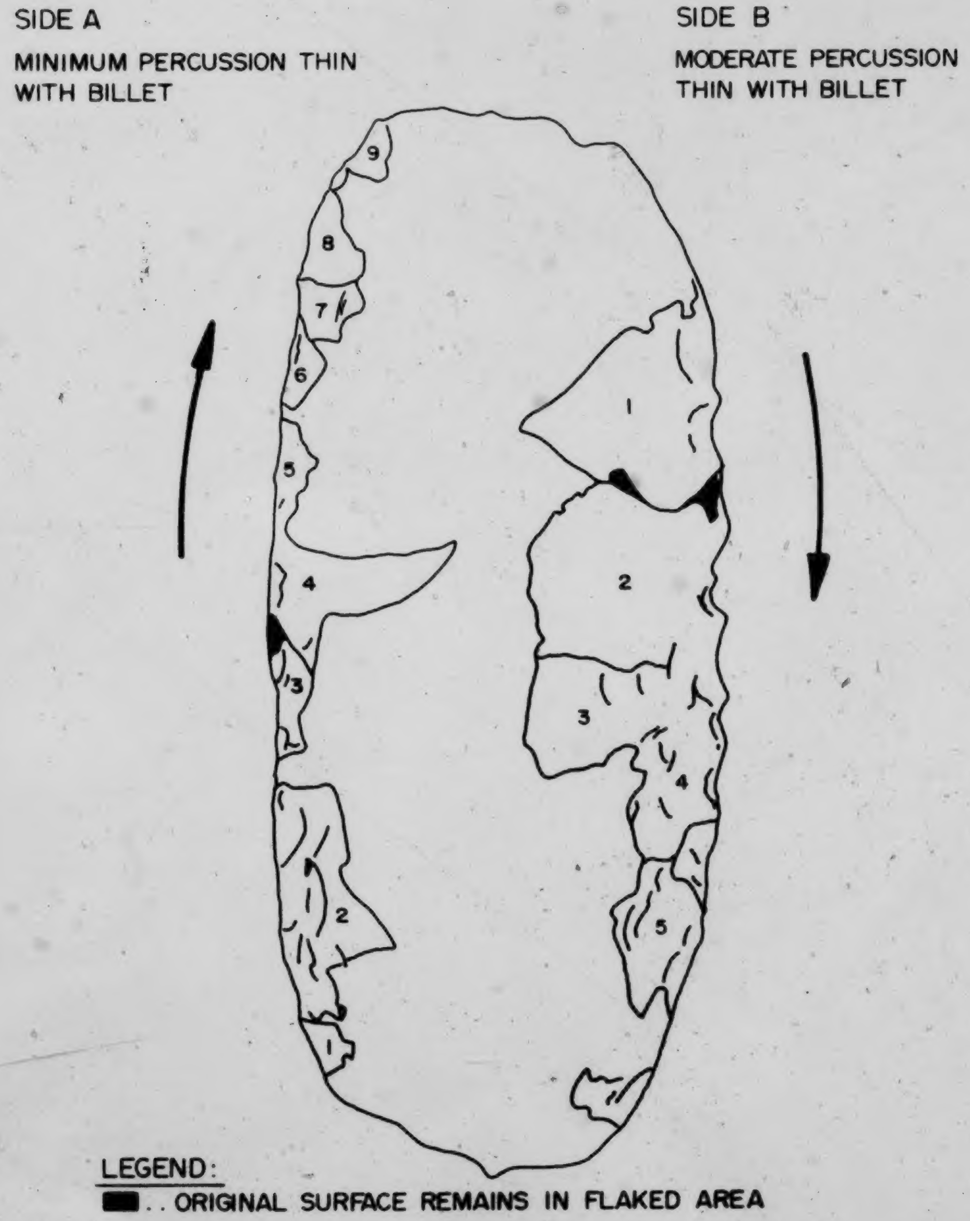
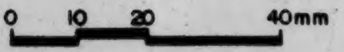

SIDE A
MINIMUM PERCUSSION THIN WITH BILLET
SIDE B
MODERATE PERCUSSION THIN WITH BILLET
9
8
7
6
5
4
3
2
1
1
2
3
4
5
LEGEND:
■ .. ORIGINAL SURFACE REMAINS IN FLAKED AREA

Figure 24: Line drawing of specimen AB5-9.



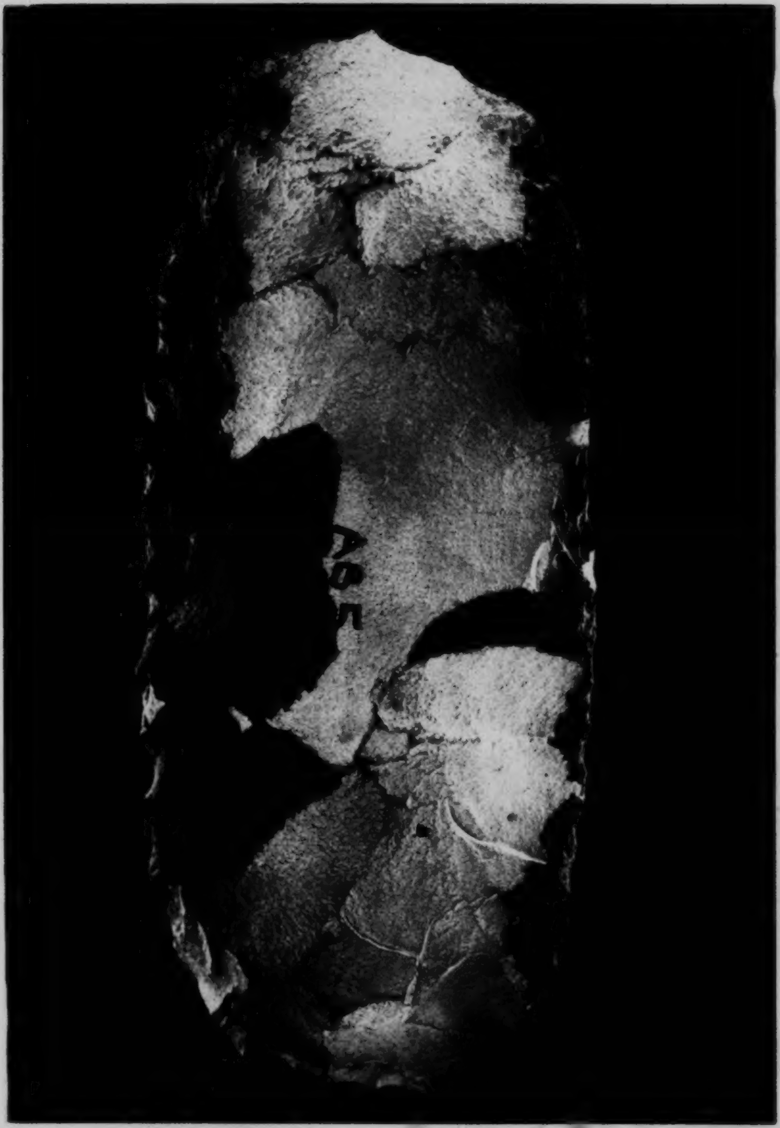


Plate 35: Photograph of Experimental Specimen AB5-9.

Table 47: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB7-10

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 2, A2, #3A

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Substantial percussion thin with billet (some edge abrading was done in preparation for the soft hammer percussion flaking (videotape 5327). This material is at the coarse end of the range found at the aboriginal quarry, and therefore, some attributes such as ribs may not translate well.

2.1 Extent of Effect: substantial - 4

2.2 Type of Behavior: percussion thin - 51

2.3 Tool Used: billet 51 (medium size)

2.4 Total Flake Scars on Specimen: 4 used

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal			
1.1.3 moderate			
1.1.4 substantial	X	2,3	50%
1.1.5 very substantial	X	1,4	50%
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	1,2,3,4	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light	X	2,3	50%
2.2.3 heavy			(coarseness of material may have enhanced damage)
2.3 MICROFLAKES			
2.3.1 absent	X	all	(a few indistinct ones may be present

2.3.2 light			
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			
2.4.1 straight			
2.4.2 U shaped notch			
2.4.3 flat curved notch	X	2,3,4	75%
2.4.4 convex projections			25% irregular due to platform collapse
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	1,2,4	75%
3.1.3 distinct	X	3	25%
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	1,2,4	75%
3.2.3 steep rise	X	3	25%
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	1,2	50%
3.3.3 thick	X	4,3	50%
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent			

4.1.2 limited			
4.1.3 moderate	X	1,4	50% (hard to see due to coarse material)
4.1.4 extensive			
4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable			
4.2.2 indistinct	X	1,4	50%
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable			
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half	X	1,4	50%
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent			
4.4.2 light	X	3	25%
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge			

5.1.2 rounded dist. edge	X	3,4	50%
5.1.3 irregular dist. edge	X	1,4	50%
5.2 SCAR TERMINATION			
5.2.1 feather	X	1	25%
5.2.2 step	X	2,3,4	75%

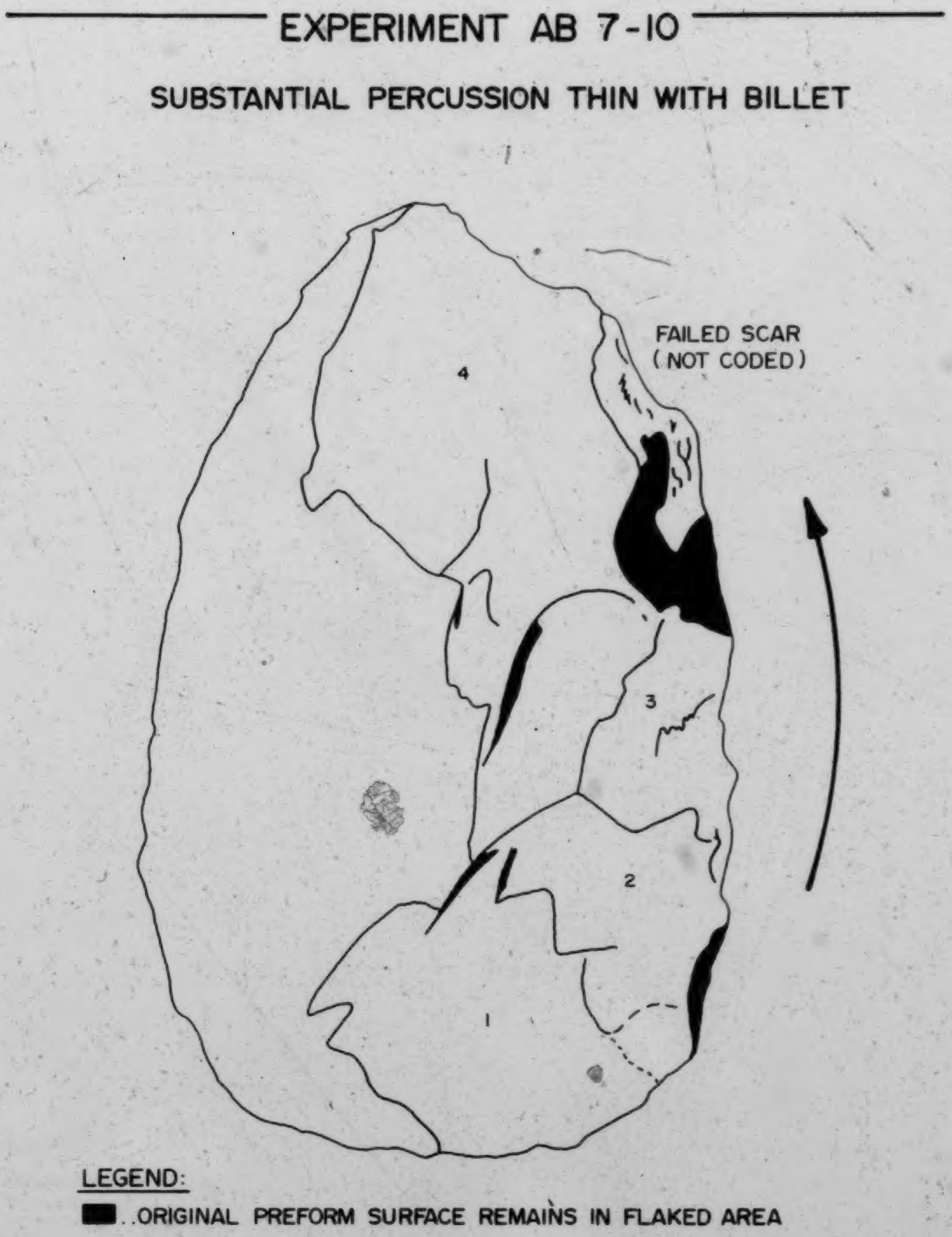

EXPERIMENT AB 7-10
SUBSTANTIAL PERCUSSION THIN WITH BILLET
FAILED SCAR
(NOT CODED)
4
3
2
1
LEGEND:
■..ORIGINAL PREFORM SURFACE REMAINS IN FLAKED AREA

Figure 25: Line drawing of specimen AB7-10.

Plate 36: Photograph of Experimental Specimen AB7-10.

Table 48: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB11-11

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 4, A4, #19

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Indirect billet percussion utilizing a vertical striking billet on a lateral (horizontal) billet set on platform. One billet end is placed on and held steady against a platform on the artifact edge. The second billet then strikes the first billet detaching the flake. Artifact edges were ground prior to flake removal (videotape 3975 to 4719).

2.1 Extent of Effect: substantial - 4

2.2 Type of Behavior: indirect percussion thin - 51

2.3 Tool Used: billet on billet - Caribou and #20 billets - 51

2.4 Total Flake Scars on Specimen: 3

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal			
1.1.3 moderate			
1.1.4 substantial	X	2,3	66.6%
1.1.5 very substantial	X	1	33.3%
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	1,2,3	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent	X	1,3	66.6%
2.2.2 light	X	2	33.3%
2.2.3 heavy			
2.3 MICROFLAKES			
2.3.1 absent	X	1	33.3% very sub.
2.3.2 light	X	2,3	66.6% sub.
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			

2.4.1 straight			
2.4.2 U shaped notch			
2.4.3 flat curved notch	X	1,2,3	100%
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	1,2	66.6%
3.1.3 distinct	X	1	33.3%
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	1,2,3	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	1,2,3	the very sub. (#1) is
3.3.3 thick			borderline between thin & thick
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent			
4.1.2 limited	X	2	33.3%
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			

4.2	DISTINCTIVENESS/RIBS			
4.2.1	not applicable			
4.2.2	indistinct	X	2	33.3%
4.2.3	moderately distinct			
4.2.4	pronounced			
4.2.5	variable			
4.3	RIB SPACING			
4.3.1	not applicable			33.3% uncertain coding here
4.3.2	far apt. evenly dist.	X	2(?)	due to indistinct ribs and
4.3.3	far apt. on dist. half	X	2(?)	coarse raw material
4.3.4	close, evenly dist.			
4.3.5	close, on dist. half			
4.3.6	variable			
4.4	TEARING			
4.4.1	absent	X	2,3	66.6%
4.4.2	light	X	1	33.3% (very sub. flake)
4.4.3	heavy			
	5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1	SCAR SHAPE DIST. EDGE			
5.1.1	straight dist. edge			
5.1.2	rounded dist. edge	X	3	33.3%
5.1.3	irregular dist. edge	X	1,2	66.6%
5.2	SCAR TERMINATION			

5.2.1	feather	X	1,2,3	100%
5.2.2	step			

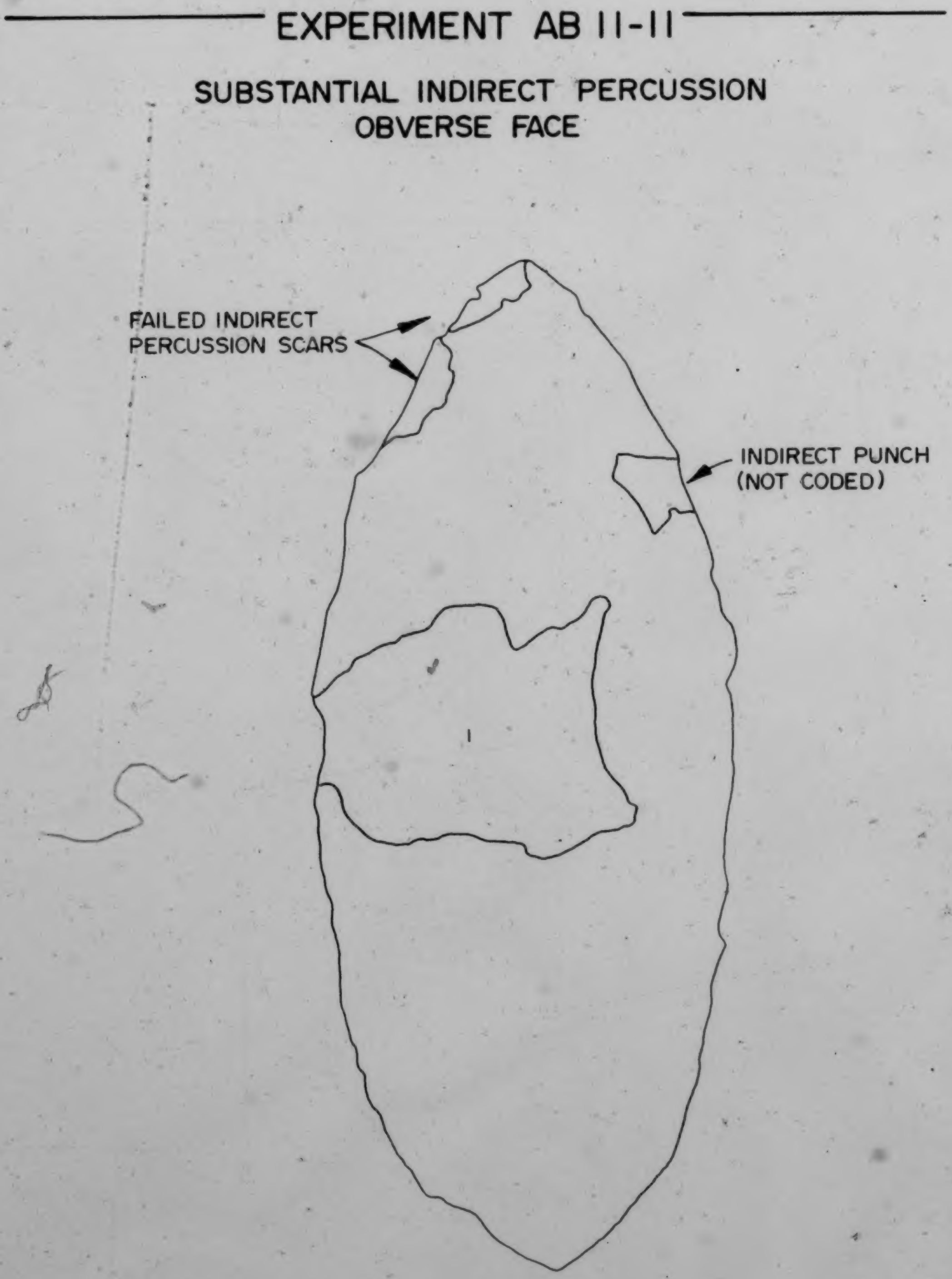

EXPERIMENT AB II-II
SUBSTANTIAL INDIRECT PERCUSSION
OBVERSE FACE
FAILED INDIRECT
PERCUSSION SCARS
INDIRECT PUNCH
(NOT CODED)
I

Figure 26: Line drawing of specimen AB11-11.
(Obverse side).

0
10
20
30mm

EXPERIMENT AB 11-11

SUBSTANTIAL INDIRECT PERCUSSION
REVERSE FACE

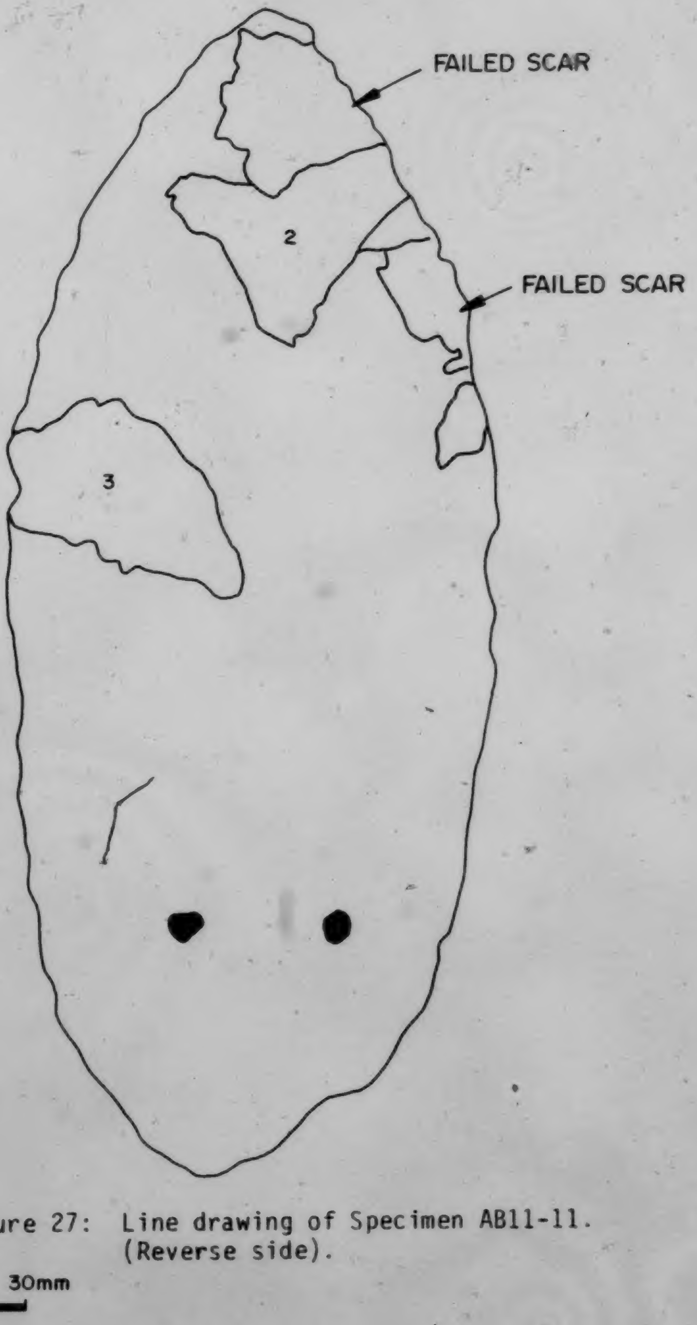

FAILED SCAR
2
FAILED SCAR
3

Figure 27: Line drawing of Specimen AB11-11.
(Reverse side).

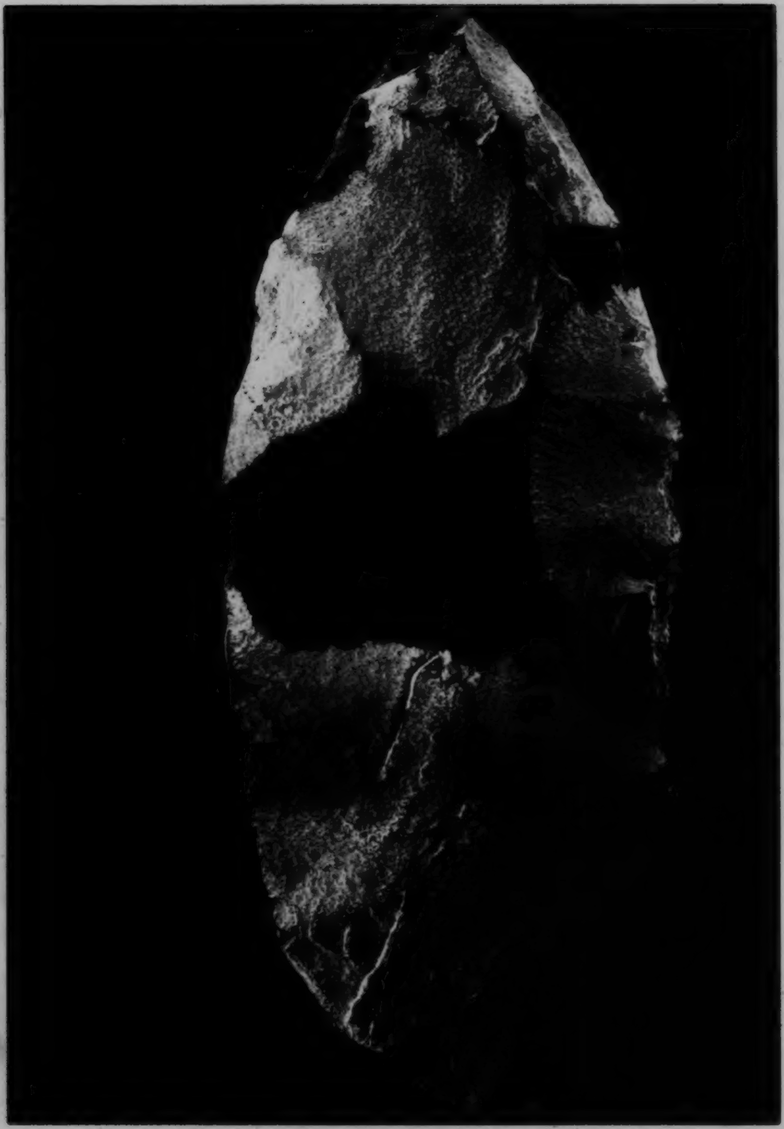


Plate 37: Photograph of Experimental Specimen AB11-11.

Table 49: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB6-13 (Side A)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 2, A2, #21a

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Minimal/moderate shear-shaping (coded as minimum) with an antler pressure flaker (side A in diagram) (videotape 5640 to 5679). Shearing involves placing the flat side of a tool against the artifact edge and slowly twisting it diagonally or vertically across the artifact edge (Nicholas & Bonnichsen n.d.:22). This unit reduces, strengthens, straightens and centers the edge all at the same time.

2.1 Extent of Effect: minimum - 2

2.2 Type of Behavior: shear shape - 22

2.3 Tool Used: pressure flaker

2.4 Total Flake Scars on Specimen: 6

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal	X	all	100%
1.1.2 minimal			
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	5,6	33.3%
2.1.2 intermediate edge	X	1,2,3,4	66.6%
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light	X	2	16.7%
2.2.3 heavy			
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light			
2.3.3 heavy	X	3,4,5,6	66.6%
2.4 PROX. EDGE MORPH.			

2.4.1 straight	X	all	mostly straight (but also follows original edge)
2.4.2 U shaped notch			
2.4.3 flat curved notch			
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable	X	all	100%
3.1.2 indistinct			
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable	X	all	100%
3.2.2 gradual rise			
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable	X	all	100%
3.3.2 thin			
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			

4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X	all	100%
4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X	all	100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X	all	100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	1,3,5	50%
5.1.2 rounded dist. edge			
5.1.3 irregular dist. edge	X	2,4,6	50%
5.2 SCAR TERMINATION			
5.2.1 feather	X	all	100%
5.2.2 step			

Table 50: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB6-13 (Side B)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 2, A2, #21a

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Moderate/substantial shear shaping (coded as moderate) with an antler pressure flaker (side B in diagram). An area of mod./sub. shear shaping with a copper tool has not been coded.

2.1 Extent of Effect: moderate to substantial (coded as mod.) - 3

2.2 Type of Behavior: shear shape - 22

2.3 Tool Used: antler pressure flaker - 30

2.4 Total Flake Scars on Specimen: 9

2.5 Attributes on the following coding form are taken from Table 14:

N.B. The mod./sub. edge on side B appears to be sharper than the min./mod. effect on side A.

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal	X	1 to 5	55.5%
1.1.2 minimal	X	6 to 9	44.4%
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge	X		
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light			
2.2.3 heavy	X	all	100%
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light			
2.3.3 heavy	X	all	100%

2.4 PROX. EDGE MORPH.			
2.4.1 straight	X	all	100% follows original edge
2.4.2 U shaped notch			
2.4.3 flat curved notch			
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable	X	all	100%
3.1.2 indistinct			
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable	X	all	100%
3.2.2 gradual rise			
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable	X	all	100%
3.3.2 thin			
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			

4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X	all	100%
4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X	all	100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X	all	100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	1,2,6,9	44.4%
5.1.2 rounded dist. edge			
5.1.3 irregular dist. edge	X	3,4,5,7,8	56%
5.2 SCAR TERMINATION			
5.2.1 feather	X	1,2,3,4,6,7,8	77.7%
5.2.2 step	X	5,9	22.2%

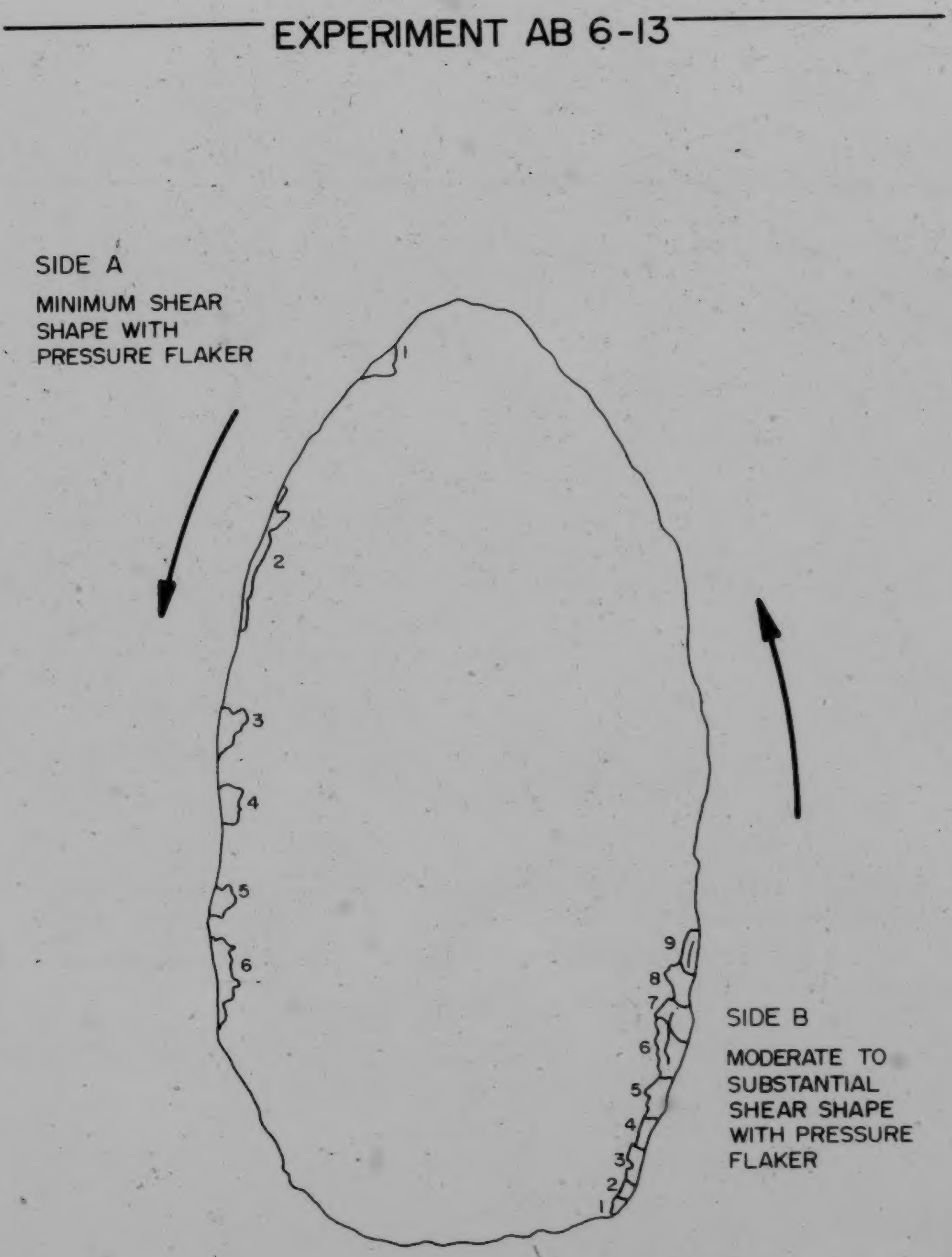

EXPERIMENT AB 6-13
SIDE A
MINIMUM SHEAR SHAPE WITH PRESSURE FLAKER
1
2
3
4
5
6
SIDE B
MODERATE TO SUBSTANTIAL SHEAR SHAPE WITH PRESSURE FLAKER
9
8
7
6
5
4
3
2
1

Figure 28: Line drawing of specimen AB6-13.

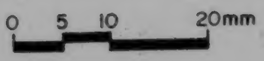


Plate 38: Photograph of Experimental Specimen AB6-13.

Table 51: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB13-15

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 3, A3, 13

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Minimum pressure shape (no attempt to thin artifact) with pressure flaker. Specimen also contains notching units with antler and copper which were not coded (videotape 5407 to 5488).

2.1 Extent of Effect: minimum - 2

2.2 Type of Behavior: pressure shape - 32

2.3 Tool Used: pressure flaker - 31

2.4 Total Flake Scars on Specimen: 16

2.5 Attributes on the following coding form are taken from Table 14:

N.B. Minimal pressure flaking resembles micro-flaking.

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal	X	all	100%
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light	X	9,10,15	18.75%
2.2.3 heavy			
2.3 MICROFLAKES			
2.3.1 absent	X	all	100% (the pressure flaking resembles microflaking
2.3.2 light			
2.3.3 heavy			

2.4 PROX. EDGE MORPH.			
2.4.1 straight			
2.4.2 U shaped notch	X	all	100%
2.4.3 flat curved notch			
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable	X	all	100%
3.1.2 indistinct			
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable	X	all	100%
3.2.2 gradual rise			
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable	X	all	100%
3.3.2 thin			
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			

4.2 DISTINCTIVENESS/RIBS

4.2.1 not applicable	X		100%
4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X		100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X		100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	1,2,5,7,11, 12,13,16	50%
5.1.2 rounded dist. edge	X	3,4,6,8,9, 10,14,15	50%
5.1.3 irregular dist. edge			
5.2 SCAR TERMINATION			
5.2.1 feather	X	1-10,12,14 15,16,	87.5%
5.2.2 step	X	11,13	12.5%

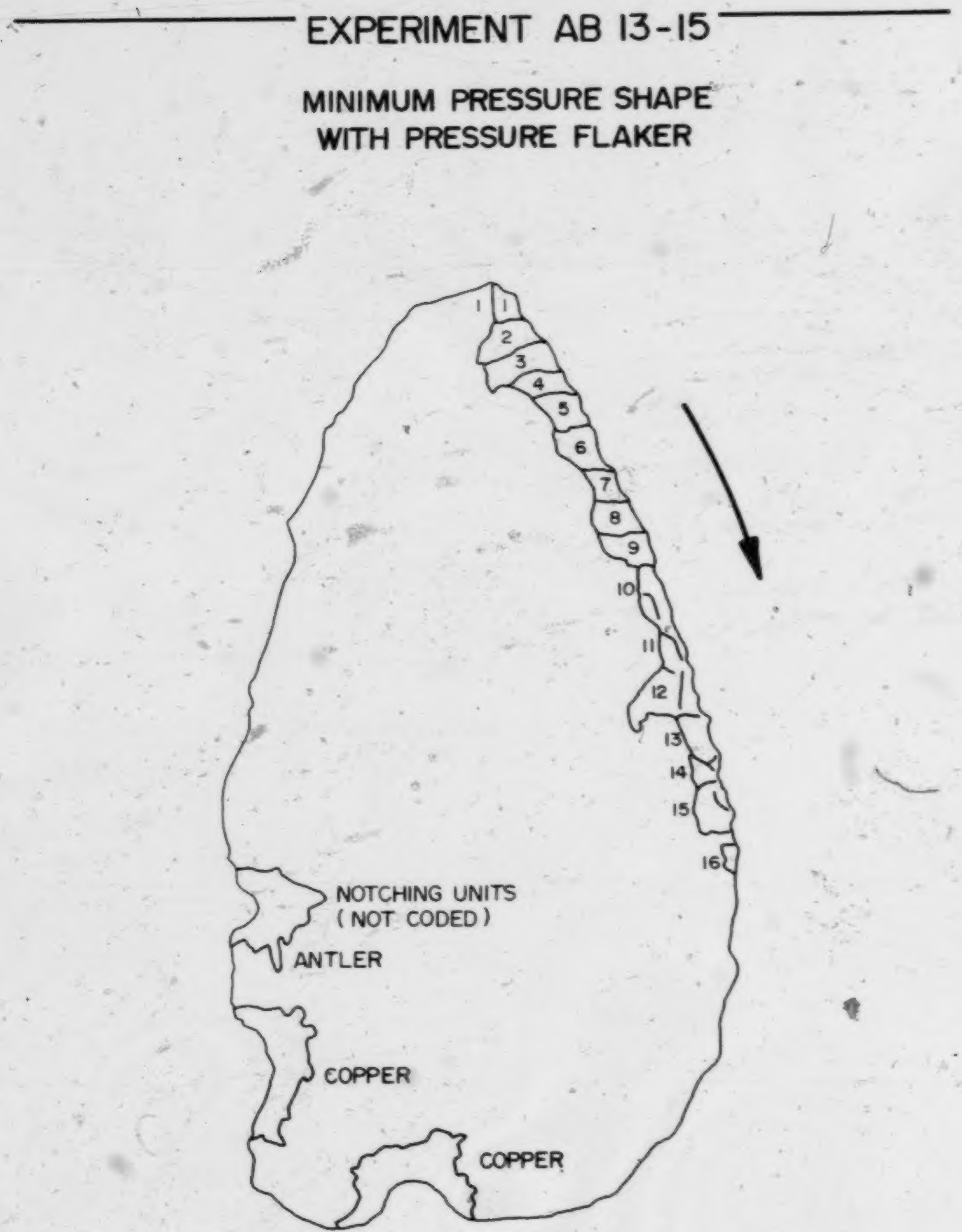

EXPERIMENT AB 13-15
MINIMUM PRESSURE SHAPE
WITH PRESSURE FLAKER
1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
NOTCHING UNITS
(NOT CODED)
ANTLER
COPPER
COPPER

Figure 29: Line drawing of specimen AB13-15.

0 5 10 20mm

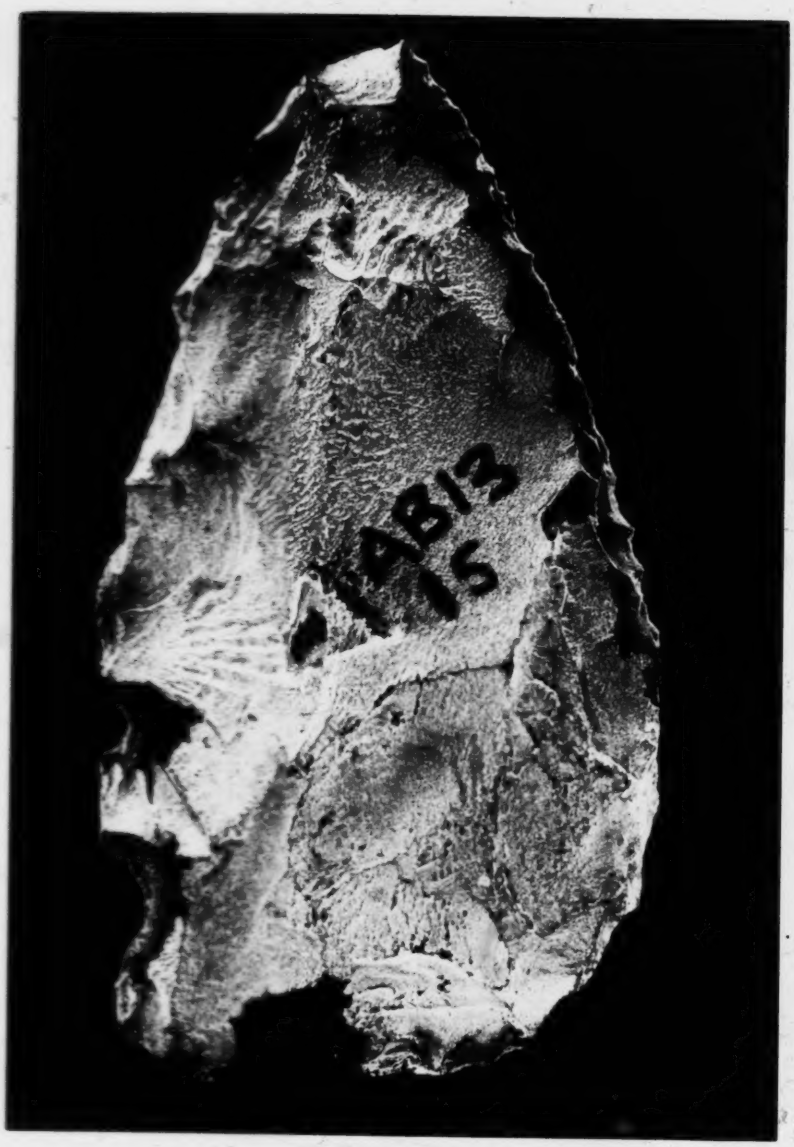


Plate 39: Photograph of Experimental Specimen AB13-15.

Table 52: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB14-16 (Side A)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 3, A3, #20

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Substantial percussion shape with hammerstone (side A in diagram) (videotape 5488 - 5542). (Originally experiment was classed as moderate.) Edge shaping involves removing material so that the edge is regularized in a symetrical curve. The major intent is shaping rather than thinning the artifact. This is accomplished by taking off large chunks of material from the edge which results in the margins being moved in at a much greater rate than the specimen is thinned.

2.1 Extent of Effect: substantial - 4

2.2 Type of Behavior: percussion shape - 42

2.3 Tool Used: hammerstone - 41

2.4 Total Flake Scars on Specimen: 3

2.5 Attributes on the following coding form are taken from Table 14:

N.B. Substantial percussion shape with hammerstone is often used on cores (R. Bonnichsen: personal communication).

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal			
1.1.3 moderate			
1.1.4 substantial	X	1,2,3	100%
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light			
2.2.3 heavy	X	1,2,3	100%
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light	X	2	33.3% (some faint ones as part of margin damage)
2.3.3 heavy			

2.4 PROX. EDGE MORPH. (platform)			
2.4.1 straight	X	2	33.3%
2.4.2 U shaped notch			
2.4.3 flat curved notch	X	1,3	66.6%
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	1,2,3	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	1,2,3	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	1,2,3	100%
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent			
4.1.2 limited	X	3	33.3%
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			

4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable			
4.2.2 indistinct	X	3	33.3% (very hard to see)
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable			
4.3.2 far apt. evenly dist.	X	3	33.3%
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent			
4.4.2 light	X	3	33.3% (some visible under 3X magnification on 1 & 2)
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	1,3	33.3%
5.1.2 rounded dist. edge			
5.1.3 irregular dist. edge	X	2	66.6%
5.2 SCAR TERMINATION			

5.2.1	feather	X	1,2	66.6%
5.2.2	step	X	3	33.3%

Table 53: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB14-16 (Side B)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 3, A3, #20

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Minimal percussion shape with hammerstone (videotape 5488 - 5542). Due to the thickness of the preform the effective shaping with minimal percussion was slight.

2.1 Extent of Effect: minimal - 1

2.2 Type of Behavior: percussion shape - 42

2.3 Tool Used: hammerstone - 41

2.4 Total Flake Scars on Specimen: 6

2.5 Attributes on the following coding form are taken from Table 14:

N.B. It would appear possible that for minimal shaping and thinning, other units rather than percussion, such as shear shaping would be more effective.

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal	X	1,4,5,6	66.6%
1.1.2 minimal	X	2,3	33.3%
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	1	16.6%
2.1.2 intermediate edge	X	2,3,4,5,6	83.3%
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light			
2.2.3 heavy	X	1,2,3,4,5,6	100%
2.3 MICROFLAKES			
2.3.1 absent	X	all	100%
2.3.2 light			
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			
2.4.1 straight	X	2,3,4,5,6	83.3%

2.4.2 U shaped notch	X	1	83.3%
2.4.3 flat curved notch			
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable	X	all	100%
3.1.2 indistinct			
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable	X	all	100%
3.2.2 gradual rise			
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable	X	all	100%
3.3.2 thin			
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X	all	100%

4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X	all	100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X	all	100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	2,3	33.3%
5.1.2 rounded dist. edge	X	1,4,5,6	66.6%
5.1.3 irregular dist. edge			
5.2 SCAR TERMINATION			
5.2.1 feather		1,4,5,6	66.6%
5.2.2 step		2,3	33.3%

EXPERIMENT AB 14-16

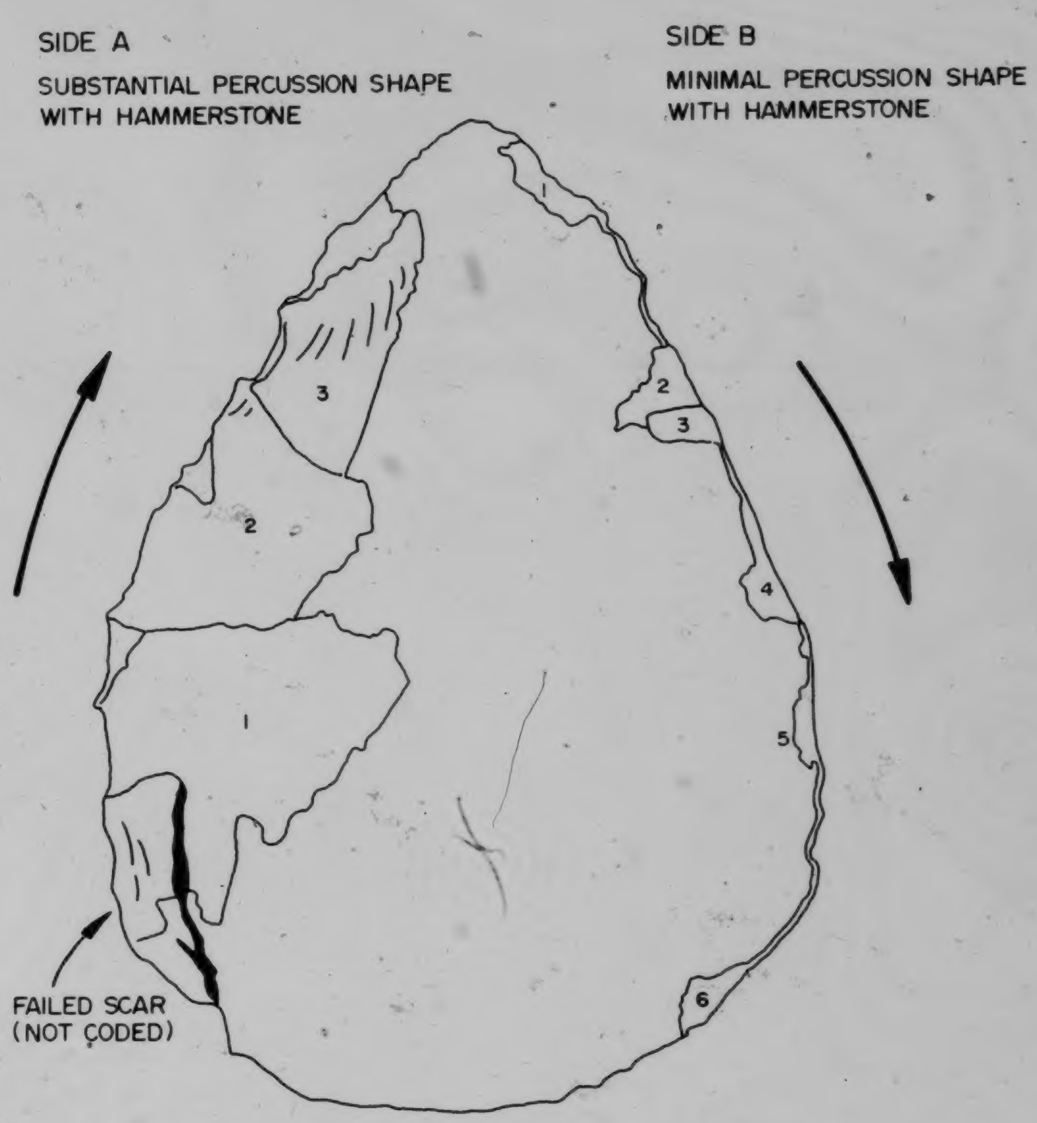

SIDE A
SUBSTANTIAL PERCUSSION SHAPE WITH HAMMERSTONE
SIDE B
MINIMAL PERCUSSION SHAPE WITH HAMMERSTONE
1
2
3
1
2
3
4
5
6
FAILED SCAR (NOT CODED)
0 5 10 20mm

Figure 30: Line drawing of specimen AB14-16.

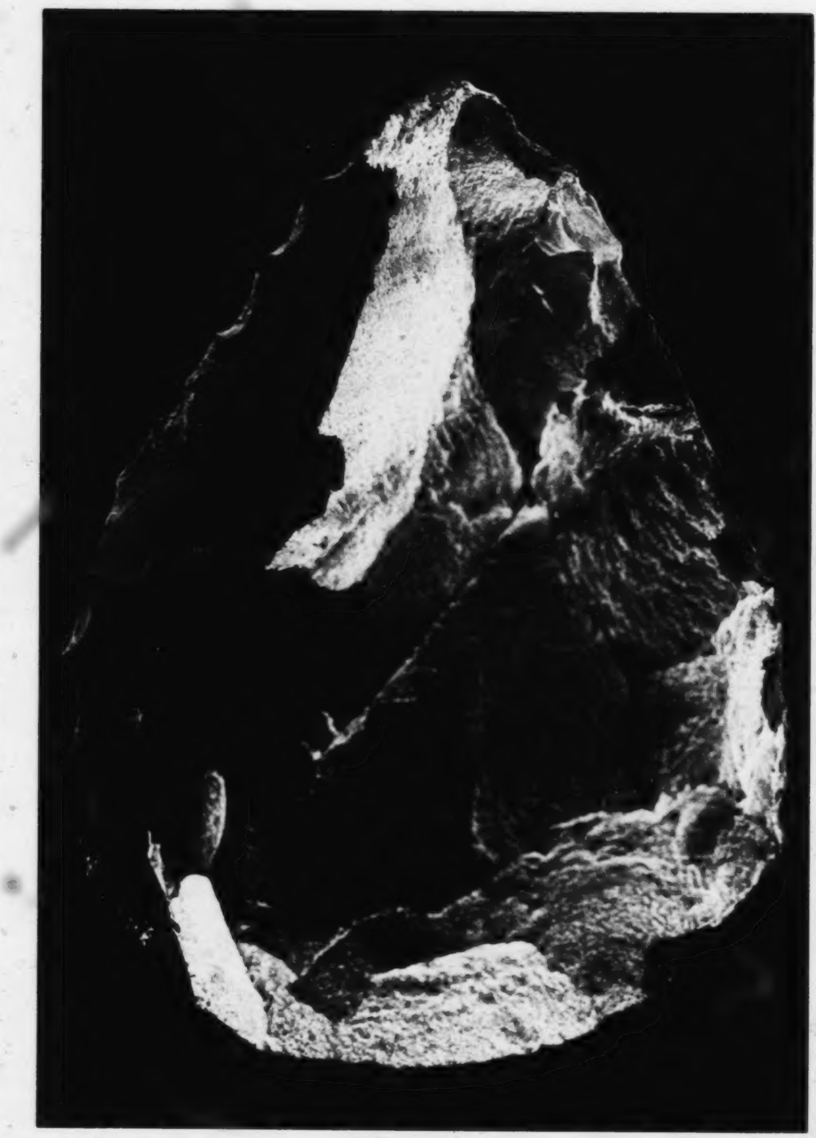


Plate 40: Photograph of Experimental Specimen AB14-16.

Table 54: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB3-17

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 3, A4, #25

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Moderate percussion shape with hammerstone. This unit was originally coded as substantial but the flake sizes indicate it should be in the moderate category (videotape 5542 to 5565). The experiment was not too successful in regularizing the edge.

2.1 Extent of Effect: moderate - 3

2.2 Type of Behavior: percussion shape - 42

2.3 Tool Used: hammerstone - 41

2.4 Total Flake Scars on Specimen: 3

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal	X	1,2	66.6%
1.1.3 moderate	X	3	33.3%
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light			
2.2.3 heavy	X	2,3	66.6%
2.3 MICROFLAKES			
2.3.1 absent	X	all	100%
2.3.2 light			
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			
2.4.1 straight	X	1	33.3%

2.4.2 U shaped notch			
2.4.3 flat curved notch	X	2,3	66.6%
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	all	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE (from bulb)			
3.2.1 not applicable			
3.2.2 gradual rise	X	all	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable	X	all	100%
3.3.2 thin			
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent			
4.1.2 limited	X	2	33.3% - only visible when light angle is right
4.1.3 moderate			
4.1.4 extensive			

N.B. Secondary experiments also produced ribs on some hard hammer percussion (John Pollock: personal communication).

4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable			
4.2.2 indistinct	X	2	33.3%
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable			
4.3.2 far apt. evenly dist.	X	2	33.3%
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent			
4.4.2 light	X		present on remnant scar
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	1,2,3	100%
5.1.2 rounded dist. edge			
5.1.3 irregular dist. edge			
5.2 SCAR TERMINATION			
5.2.1 feather	X	1	33.3%
5.2.2 step	X	2,3	66.6%

EXPERIMENT AB 3-17

MODERATE PERCUSSION SHAPE WITH HAMMERSTONE

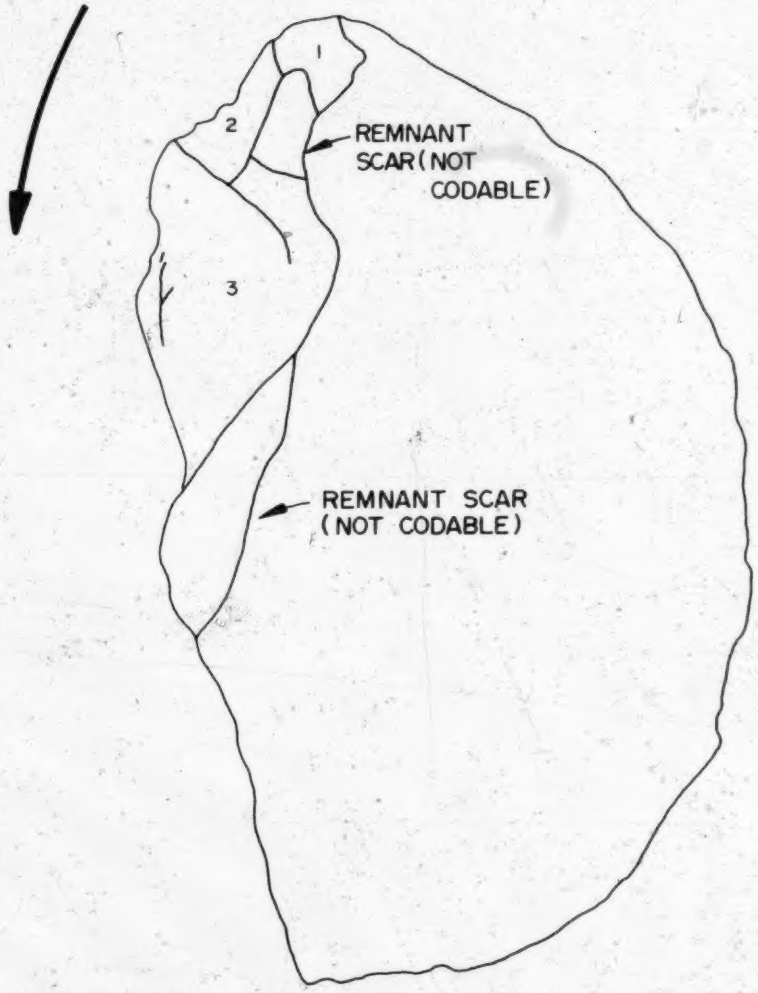

1
2
3
REMNANT SCAR (NOT CODABLE)
REMNANT SCAR (NOT CODABLE)

Figure 31: Line drawing of specimen AB3-17.

0
5
10
20mm

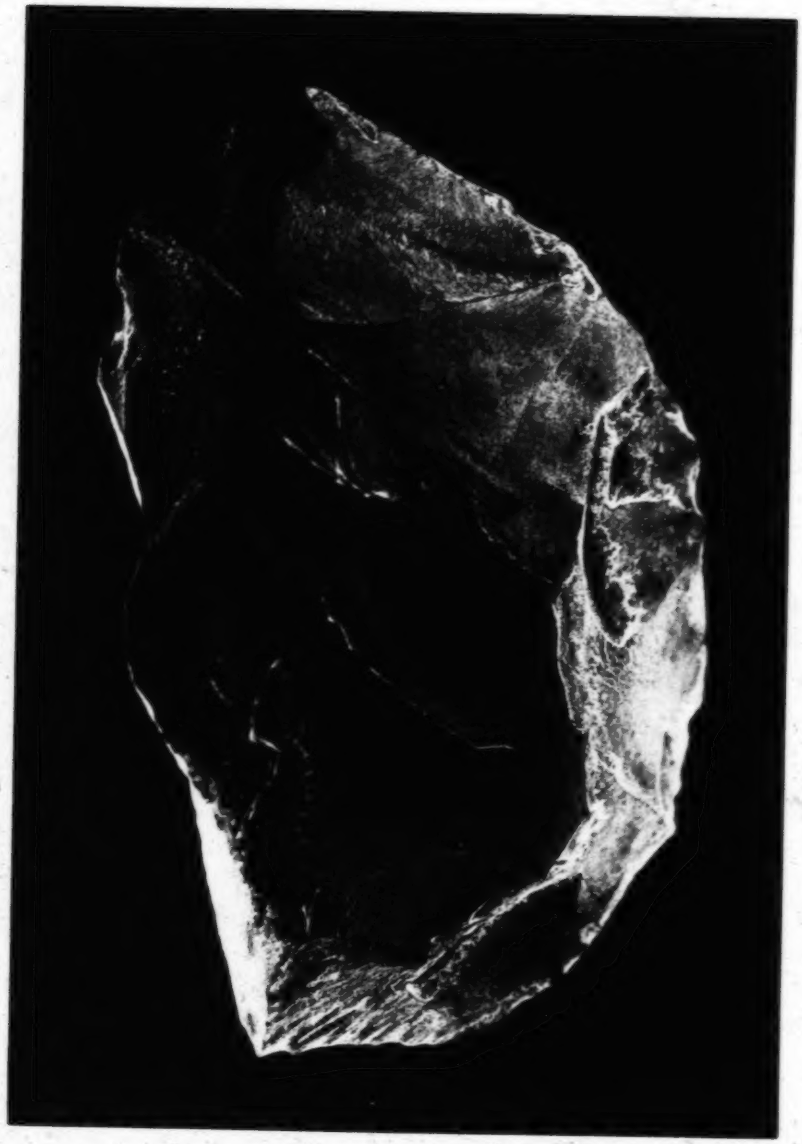


Plate 41: Photograph of Experimental Artifact AB3-17.

Table 55: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB15-18 (Side A)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Negative Identification Number: Roll 2, A2, #27A

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Moderate percussion shape with billet (on left lateral margin (Side A) (videotape 5565 - 5613). As with other forms of shaping the main interest is to move in the margins at a greater rate than the specimen is thinned.

2.1 Extent of Effect: moderate - 3

2.2 Type of Behavior: percussion shape - 42

2.3 Tool Used: billet - 51

2.4 Total Flake Scars on Specimen: 7 (6 on side A, 1 on side B)

2.5 Attributes on the following coding form are taken from Table 14:

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal			
1.1.3 moderate	X	all	100%
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light			
2.2.3 heavy	X	1,5,7	42.85%
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light	X	5,6	28.6%
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			

N.B. Scar #7 on side B is a good example of a billet scar.

2.4.1 straight	X	4,5,6	42.86%
2.4.2 U shaped notch			
2.4.3 flat curved notch	X	1,2,3,7	57.14% other platforms not present
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	1-6	85.72%
3.1.3 distinct	X	7	14.28%
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise			
3.2.3 steep rise	X	1,2,7	42.85%
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	1-6	85.72%
3.3.3 thick	X	7	14.28%
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent			
4.1.2 limited	X	7	14.28% (very indistinct)
4.1.3 moderate			
4.1.4 extensive			

4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable			
4.2.2 indistinct	X	7	14.28%
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable			
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half	X	7	14.28%
4.3.4 close, evenly dist.			(ribs very
4.3.5 close, on dist. half			hard to see)
4.3.6 variable			
4.4 TEARING			
4.4.1 absent			
4.4.2 light	X	7	14.28% very indistinct similar to sub. hard hammer
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	1,3,4,5	57.14%
5.1.2 rounded dist. edge	X	2,6,7	42.85%
5.1.3 irregular dist. edge			

5.2 SCAR TERMINATION

5.2.1 feather	X	1,2,3,4,7	71.4%
5.2.2 step	X	5,6	28.6%

Table 56: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB15-18 (Side B)

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 2, A2, #27a

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Minimum percussion shape with billet (right lateral margin, side B) (videotape 5565 - 5613).

2.1 Extent of Effect: minimal - 2

2.2 Type of Behavior: percussion shape - 42

2.3 Tool Used: billet - 51

2.4 Total Flake Scars on Specimen: 5

2.5 Attributes on the following coding form are taken from Table 14:

N.B. Minimal percussion with a billet is similar to AB16-7 and AB5-9 (minimum percussion thins with hammerstone and billet). These produce similar effects in edge crushing, etc. See note on experiment AB5-9.

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal	X	all	100%
1.1.3 moderate			
1.1.4 substantial			
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS			
2.1.1 sharp edge	X	all	100%
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light			
2.2.3 heavy	X	all	100%
2.3 MICROFLAKES			
2.3.1 absent			
2.3.2 light			
2.3.3 heavy	X	1-4	80%
2.4 PROX. EDGE MORPH.			
2.4.1 straight	X	all	100%

2.4.2 U shaped notch			
2.4.3 flat curved notch			
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable	X	all	100%
3.1.2 indistinct			
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable	X	all	100%
3.2.2 gradual rise			
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable	X	all	100%
3.3.2 thin			
3.3.3 thick			
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent	X	all	100%
4.1.2 limited			
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable	X	all	100%

4.2.2 indistinct			
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable	X	all	100%
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half			
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent	X	all	100%
4.4.2 light			
4.4.3 heavy			
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	1,2,3,4	80%
5.1.2 rounded dist. edge	X	5	20%
5.1.3 irregular dist. edge			
5.2 SCAR TERMINATION			
5.2.1 feather	X	1,3,4,5	80%
5.2.2 step	X	2	20%

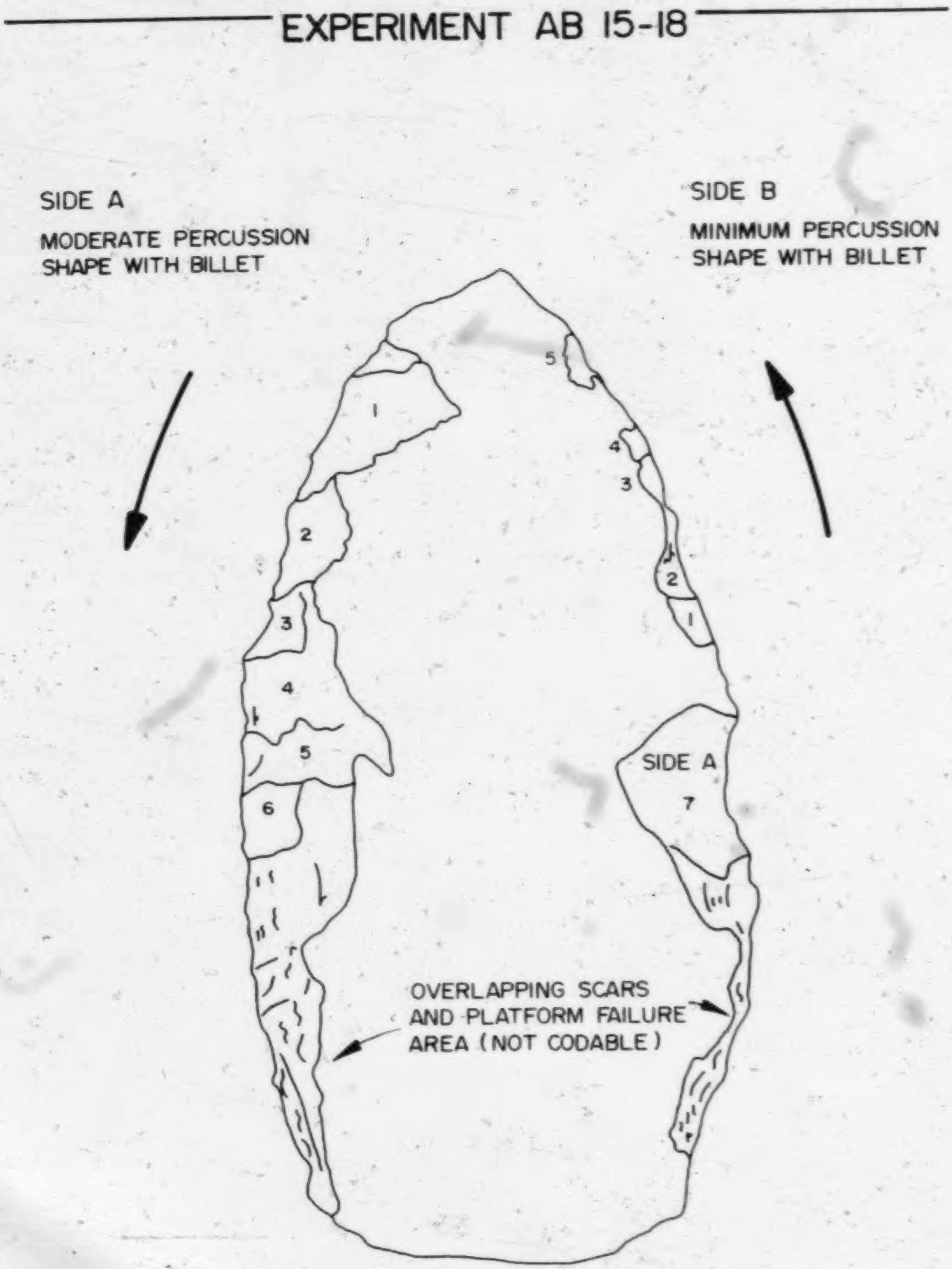

EXPERIMENT AB 15-18
SIDE A
MODERATE PERCUSSION
SHAPE WITH BILLET
SIDE B
MINIMUM PERCUSSION
SHAPE WITH BILLET
1
2
3
4
5
6
5
4
3
2
1
SIDE A
7
OVERLAPPING SCARS
AND PLATFORM FAILURE
AREA (NOT CODABLE)

Figure 32: Line drawing of specimen AB15-18.

0 5 10 20mm

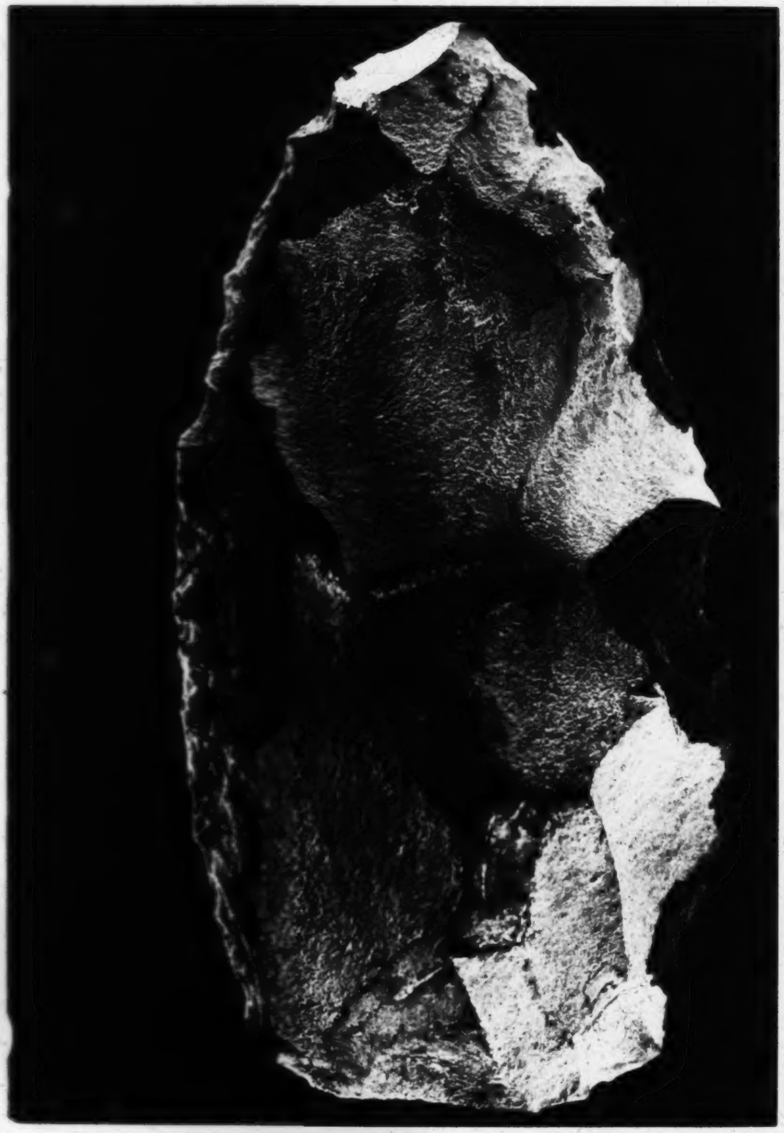


Plate 42: Photograph of Experimental Specimen AB15-18.

Table 57: Individual Flake Scar Attribute Form - Experimental Specimens

1.0 Experimental Specimen Catalogue Number: AB12-19

1.1 Experimental Specimen Storage Location: University of Alberta

1.2 Lithic Raw Material Type Used: Welded Tuff from Lake Abitibi, Ont.

1.3 Modern Lithic Craftsman: Dr. R. Bonnichsen

1.4 Flake Scar Attributes

Coded From: Photograph(s) X Drawing(s) X Artifact(s) X

1.5 Photographic Plate Identification Number: Roll 3, A4, #37

1.6 Video Tape Reel Identification Number: V-22-04-001

2.0 Description of Experiment:

Substantial percussion shape with billet (videotape 5613 - 5640). The purpose of percussion shaping is to move in the margins by taking off large thick flakes from the artifact edges, thus moving the edge rather than thinning the specimen.

2.1 Extent of Effect: substantial - 4

2.2 Type of Behavior: percussion shape - 42

2.3 Tool Used: billet - 51

2.4 Total Flake Scars on Specimen: 4

2.5 Attributes on the following coding form are taken from Table 14:

N.B. The flake size category differentiation may not be useful for shape units as these do not produce the long thin flakes resulting from thinning units.

Attributes and Attribute States	Attribute States Present on Experimental Flake Scars	#'s of Flake Scars Exhibiting Attribute State Checked in First Column	% of Relevant Scars Exhibiting Attribute State Checked in First Column
1.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
1.0 FLAKE SCAR SIZE			
1.1.1 very minimal			
1.1.2 minimal			
1.1.3 moderate			
1.1.4 substantial	X	1-4	100%
1.1.5 very substantial			
2.0 FLAKE SCAR PROXIMAL EDGE ATTRIBUTES			
2.1 EDGE SHARPNESS	X	all	100%
2.1.1 sharp edge			
2.1.2 intermediate edge			
2.1.3 dull edge			
2.2 MARGIN DAMAGE			
2.2.1 absent			
2.2.2 light			
2.2.3 heavy	X	all	100%
2.3 MICROFLAKES			
2.3.1 absent	X	all	100%
2.3.2 light			
2.3.3 heavy			
2.4 PROX. EDGE MORPH.			
2.4.1 straight			

2.4.2 U shaped notch			
2.4.3 flat curved notch	X	1,2,3,4	100%
2.4.4 convex projections			
2.4.5 other			
3.0 FLAKE SCAR PROFILE ATTRIBUTES			
3.1 PERCUSSION BULB			
3.1.1 not applicable			
3.1.2 indistinct	X	all	100%
3.1.3 distinct			
3.2 TRANSITION ANGLE			
3.2.1 not applicable			
3.2.2 gradual rise	X	all	100%
3.2.3 steep rise			
3.3 FLAKE THICKNESS			
3.3.1 not applicable			
3.3.2 thin	X	1,2,4	75%
3.3.3 thick	X	3	25%
4.0 FLAKE SCAR INTERIOR MORPHOLOGY ATTRIBUTES			
4.1 RIBS			
4.1.1 absent			
4.1.2 limited	X	2	25%
4.1.3 moderate			
4.1.4 extensive			
4.1.5 very extensive			
4.2 DISTINCTIVENESS/RIBS			
4.2.1 not applicable			

4.2.2 indistinct	X	2	25%
4.2.3 moderately distinct			
4.2.4 pronounced			
4.2.5 variable			
4.3 RIB SPACING			
4.3.1 not applicable			
4.3.2 far apt. evenly dist.			
4.3.3 far apt. on dist. half	X	2	25%
4.3.4 close, evenly dist.			
4.3.5 close, on dist. half			
4.3.6 variable			
4.4 TEARING			
4.4.1 absent			
4.4.2 light			
4.4.3 heavy	X ✓	2,3,4	75%
5.0 FLAKE SCAR DISTAL EDGE ATTRIBUTES			
5.1 SCAR SHAPE DIST. EDGE			
5.1.1 straight dist. edge	X	2,3,4	75%
5.1.2 rounded dist. edge	X	1	25% (flakes terminate along scar ridge)
5.1.3 irregular dist. edge			
5.2 SCAR TERMINATION			
5.2.1 feather	X	all	100%
5.2.2 step			

EXPERIMENT AB 12-19

SUBSTANTIAL PERCUSSION SHAPE BILLET

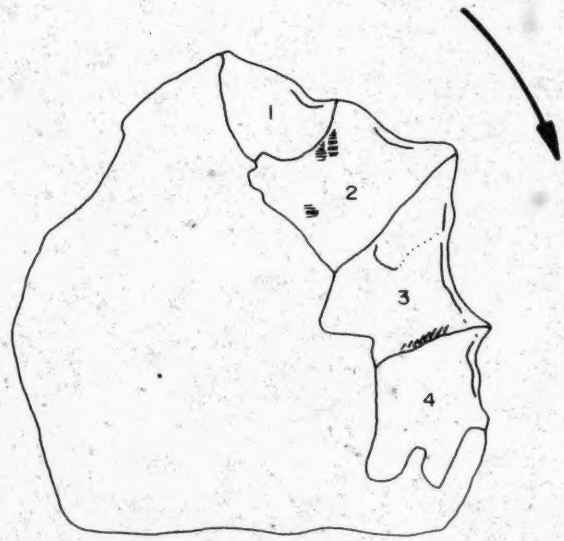
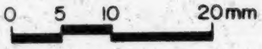


Figure 33: Line drawing of specimen AB12-19.



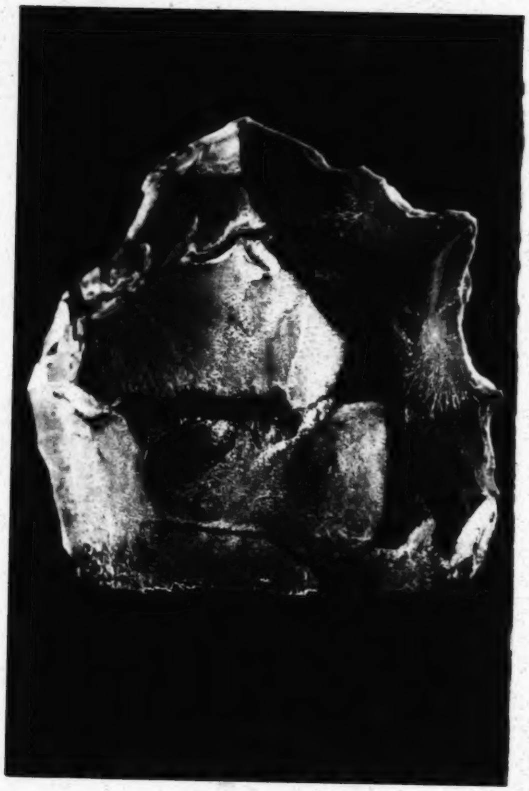


Plate 43: Photograph of Experimental Specimen AB12-19.

APPENDIX 5. PREHISTORIC ARTIFACTS

Table 58: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face:

1.2 Prehistoric Specimen Provenience:

1.3 Specimen Catalogue #:

1.4 Photographic Plate Identification:

1.5 Standard Artifact Description:

1.6 Raw Material:

1.7 Shape/Artifact Class:

1.8 Flaking (Bifacial/Unifacial):

1.9 Metric Size: length -
width -
thickness -

1.10 Form/Morphology Description:

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact #	Main Flake Scar #	Edge Treatment on Same Scar	Notes
1.1	Scar Size			
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force			
3.2	Bulb to Scar Transition Angle			
3.3	Flake Thickness			
4.1	Presence or Absence of Ribs			
4.2	Distinctiveness of Ribs			
4.3	Rib Spacing And Distribution			
4.4	Tearing			
5.1	Scar Shape at Distal Edge			
5.2	Scar Termination at Distal Edge			

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar

1.1

2.1

2.2

2.3

2.4

3.1

3.2

3.3

4.1

4.2

4.3

4.4

5.1

5.2

Total +

Total -

% +

% -

Score

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units:

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

(b) Reconstructing Sequencing of Production Units:

3.4 Flow Diagram of Production Units (below)

3.5 Description and Discussion of Technological Grammar Found on Artifact

Table 59: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: DeHa-8 - Jordan Site

1.3 Specimen Catalogue #: C01083

1.4 Photographic Plate Identification: Roll 2, B3, #30A
Roll 3, B4, #27

1.5 Standard Artifact Description

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: Lanceolate Biface

1.8 Flaking (Bifacial/Unifacial): Bifacial

1.9 Metric Size: length - 10.3 cm
width - 4.8 cm
thickness - 1.3 cm

1.10 Form/Morphology Description:

This is a finished, broad, lanceolate biface which was originally a large flake. The obverse side of the former flake has been subjected to a series of shallow thinning flake removals while the reverse side exhibits an even larger number of flake scars. From a judgmental viewpoint, the specimen appears to be well made. Finally, some water-caused wear or polish is visible on the scar ridges of the reverse face.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01083	Main Flake Scar # 0-5	Edge Treatment on Same Scar	Notes
1.1	Scar Size	sub.	very (2) minimal (3)	1. bulb of force removed by edge treatment.
2.1	Edge Sharpness		intermediate to dull	
2.2	Margin Damage		0	2. Edge Unit #1 coded from scars 1 to 7 and 25-29.
2.3	Microflakes		light	
2.4	Proximal Edge Morphology		straight with minor convex. projections	
3.1	Negative Bulb of Force	(see Note 1) n/a		
3.2	Bulb to Scar Transition Angle	n/a		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart mid point to distal end		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded	predominantly rounded	
5.2	Scar Termination at Distal Edge	predominantly feather	predominantly step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 05, C01083

	Prehistoric C01083 Scar 05	AB7-10 Sub. Perc. Thin Billet	AB8-6 Sub. Press. Thin P.F.	AB11-11 Sub. Indirect Percussion	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1					
3.2					
3.3	thin	+ 50 - 50	+ 1	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 75 - 25	+ 1	+ 1	+ 1
4.3	* n/a	n/a	n/a	n/a	n/a
4.4	0	+ 75 - 25	+ 75 - 25	+ 66.6 - 33.3	+ 60 - 40

5.1	rounded	+ 50 - 50	+ 75 - 25	+ 33.3 - 66.7	+ 40 - 60
5.2	predominantly feather	+ 25 - 75	+ 1	+ 60 - 40	+ 40 - 60
Total	+	+ 4.25	+ 6	+ 4.93	+ 5.0
	-	- 2.75	- 1	- 2.07	- 2.0
%	+	+ 60.71	+ 86	+ 70.42	+ 71.42
	-	- 39.29	- 14	- 29.57	- 28.57
Score		+ 21.42	+ 72	+ 40.85	+ 42.85

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

* Ribs continue through to next scar - may be a feature of the raw material - attributed not including in coding or scoring.

Highly probable + 72 - Sub Pressure Thin with P.F.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar C01083, Edge Unit 1 (Scar 05)

	Prehistoric C01083 Edge Unit 1	AB10-1(b) Min. Rub/Buffet with Billet	AB10-1(a) Min. Rub/Buffet Hammerstone	AB6-13(a) Min. Shear Shape with P.F.	AB2-2(c) Min. Platform Isolating P.F.	AB9-5(b) Min. Press. Thin with P.F.
1.1	very minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate to dull	+ 1	+ 1	+ 50 - 50	- 1	- 1
2.2	0	+ 85 - 15	- 1	+ 83.3 - 16.7	+ 14.28 - 85.72	+ 83 - 17
2.3	light	+ 15 - 85	- 1	- 1	+ 42.85 - 57.15	- 1
2.4	straight with convex project	+ 1	+ 1	+ 1	- 1	- 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	pred. rounded	- 1	+ 25 - 75	- 1	+ 15 - 85	- 1
5.2	pred. step	+ 8 - 92	+ 50 - 50	- 1	+ 71 - 29	+ 58.4 - 41.6
Total	+	+ 4.08	+ 3.75	+ 3.33	+ 2.43	+ 2.41
	-	_ 2.92	_ 3.25	_ 3.67	- 4.57	_ 4.59
%	+	+ 58	+ 54	+ 48	+ 35	+ 34
	-	- 42	- 46	- 52	- 65	- 66
Score		+ 16	+ 8	- 4	- 30	- 32

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Indeterminate + 8 - min. rub buffet with hammerstone.

Based on the adjacent unit which scored + 64 for min. rub buffet with hammerstone it is likely that this unit is the same even though the billet scored higher in this case.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01083	Main Flake Scar # 012	Edge Treatment on Same Scar	Notes
1.1	Scar Size	(1) moderate	(2) n/a	1. This scar overlaps another larger scar # 32 which is essentially similar.
2.1	Edge Sharpness		intermediate to dull	
2.2	Margin Damage		light	2. Edge Unit # 3 coded from scars 8 to 14.
2.3	Microflakes		0	
2.4	Proximal Edge Morphology		straight	3. The proximal portion of this scar is missing.
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Shape Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. close together on dist. 1/2 (3)		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight	straight and rounded	
5.2	Scar Termination at Distal Edge	feather and step	feather and step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 012, C01083

	Prehistoric C01083 Scar 012	AB8-6 Sub. Press. Thin with P.F.	AB9-5(a) Mod. Press. Thin	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9 Mod. Perc. Thin Billet	AB15-18(a) Mod. Perc. Shape Billet
1.1	moderate	+ 1	+ 67 - 33	+ 60 - 40	+ 40 - 60	+ 1
2.1						
2.2						
2.3						
2.4						
3.1	indistinct	+ 1	+ 1	+ 1	+ 80 - 20	+ 85.72 - 14.28
3.2	gradual	+ 1	+ 1	+ 1	+ 80 - 20	+ 1
3.3	thin	+ 1	+ 1	+ 80 - 20	+ 80 - 20	+ 85.72 - 14.28
4.1	present	+ 50 - 50	+ 22.2 - 77.8	+ 80 - 20	+ 20 - 80	+ 14.28 - 85.72
4.2	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
4.3	rel. close together dist. 1/2	+ 1	+ 1	- 1	- 1	- 1
4.4	0	+ 75 - 25	+ 1	+ 60 - 40	+ 80 - 20	+ 85.72 - 14.28

5.1	straight	+ 25 - 75	+ 55.6 - 44.4	+ 60 - 40	+ 60 - 40	+ 57.1 - 42.9
5.2	feather and step	+ 1	+ 1	+ 1	+ 1	+ 1
Total	+	+ 8.5	+ 8.45	+ 7.4	+ 6.4	+ 7.29
	-	- 1.5	- 1.55	- 2.6	- 3.6	2.71
%	+	+ 85	+ 85	+ 74	+ 64	+ 73
	-	- 15	- 15	- 26	- 36	- 27
Score		+ 70	+ 70	+ 48	+ 28	+ 46

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly probable + 70 sub. press. thin with p.f.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar C01083 Edge Unit # 3

	Prehistoric C01083 Edge Unit # 3	AB2-2(a) Min. Rub/Abrade Hammerstone	AB10-1(b) Min. Rub/Buffet Billet	AB14-16(a) Min. Perc. Shape Hammer	AB6-13(a) Min. Shear Shape with P.F.	AB10-1(a) Min. Rub/Buffet Hammerstone
1.1	n/a	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate to dull	+ 1	+ 1	+ 83.3 - 16.7	+ 66.7 - 33.3	+ 1
2.2	light	- 1	+ 15 - 85	- 1	+ 16.7 - 83.5	- 1
2.3	0	+ 1	+ 85 - 15	+ 1	+ 33.3 - 66.7	+ 1
2.4	straight	+ 1	+ 1	+ 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight	+ 50 - 50	- 1	+ 1	+ 50 - 50	+ 75 - 25
5.2	feather and step	+ 50 - 50	+ 1	+ 1	+ 50 - 50	+ 1
Total	+	+ 5	+ 5	+ 5.83	+ 4.17	+ 5.75
	-	- 2	- 2	- 1.17	- 2.83	- 1.25
%	+	+ 71	+ 71	+ 83	+ 60	+ 82
	-	- 29	- 29	- 17	- 40	- 18
Score		+ 42	+ 42	+ 66	+ 20	+ 64

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible - + 64 - Min. Rub/Buffet Hammerstone.

N.B. There is also a small area of min. shear shape with a p.f. on the base (scar R15 area).

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01083	Main Flake Scar # 0-24	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. Platform relatively unmodified.
2.1	Edge Sharpness	sharp		
2.2	Margin Damage	light		
2.3	Microflakes	0		
2.4	Proximal Edge Morphology	flat curve notch		
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	far apart mid to dist. 1/2		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 024, C01083

	Prehistoric COI083 Scar 024	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB8-6 Sub. Press. Thin with P.F.	AB5-9(b) Mod. Perc. Thin Billet
1.1	moderate	+ 60 - 40	+ 1	+ 40 - 60
2.1	sharp	+ 1	+ 1	+ 1
2.2	light	- 1	+ 50 - 50	+ 60 - 40
2.3	0	+ 60 - 40	+ 1	+ 60 - 40
2.4	flat curved notch	+ 1	- 1	+ 1
3.1	indistinct	+ 1	+ 1	+ 80 - 20
3.2	gradual	+ 1	+ 1	+ 80 - 20
3.3	thin	+ 80 - 20	+ 1	+ 80 - 20
4.1	present	+ 80 - 20	+ 50 - 50	+ 20 - 80
4.2	indistinct	+ 1	+ 1	+ 1
4.3	far apart on dist. 1/2	- 1	- 1	+ 1
4.4	0	+ 60 - 40	+ 75 - 25	+ 80 - 20

5.1	straight	+ 60 - 40	+ 25 - 75	+ 60 - 40
5.2	step	+ 60 - 40	+ 1	+ 50 - 50
Total	+	+ 9.60	+ 10	+ 10.10
	-	- 4.40	- 4	- 3.90
%	+	+ 69	+ 71	+ 72
	-	- 31	- 29	- 28
Score		+ 38	+ 42	+ 44

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Identification is difficult because the scars are very close together but based on the fact that a similar nearby scar has been identified (026) as pressure flaking this scar is identified as:

Possible + 42 Sub. Press. Thin with P.F.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01083	Main Flake Scar # 0-26	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. May have been used as a platform for removal of scar # R-6 on other side.
2.1	Edge Sharpness			
2.2	Margin Damage			2. Edge Unit 1 coded from 1-7 and 25-29. (Coded on scar 05)
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 026, C01083

	Prehistoric C01083 Scar 026	AB5-9 Mod. Perc. Thin Billet	AB8-6 Sub. Press. Thin with P.F.	AB9-5(a) Mod. Press. Thin	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	moderate	+ 40 - 60	+ 1	+ 67.33	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 80 - 20	+ 1	+ 1	+ 1
3.2	gradual	+ 80 - 20	+ 1	+ 1	+ 1
3.3	thin	+ 80 - 20	+ 1	+ 1	+ 1
4.1	0	+ 80 - 20	+ 50 - 50	+ 77.8 - 22.2	+ 20 - 80
4.2	n/a	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a	n/a
4.4	0	+ 80 - 20	+ 75 - 25	+ 1	+ 60 - 40

5.1	rounded	+ 40 - 60	+ 75 - 25	+ 11.1 - 88.9	+ 40 - 60
5.2	step	+ 50 - 50	+ 25 - 75	+ 22.2 - 77.8	+ 60 - 40
Total	+	+ 5.3	+ 6.25	+ 5.78	+ 5.8
	-	- 2.7	- 1.75	- 2.22	- 2.2
%	+	+ 66	+ 78	+ 72	+ 73
	-	- 34	- 22	- 28	- 27
Score		+ 32	+ 56	+ 44	+ 46

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 56 Sub. Press. Thin with P.F.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01083	Main Flake Scar # R-6	Edge Treatment on Same Scar	Notes
1.1	Scar Size	Substantial	(1)	1. Edge Unit coded on Scar # R23 platform for this scar largely intact.
2.1	Edge Sharpness	sharp		
2.2	Margin Damage	light		
2.3	Microflakes	light		
2.4	Proximal Edge Morphology	flat curved notch		
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on dist. 1/2		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather and step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar # R6, C01083

	Prehistoric C01083 Scar R6	AB7-10 Sub. Perc. Thin Billet	AB5-9 Mod. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	Substantial	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 1
2.2	light	+ 50 - 50	+ 60 - 40	+ 33.3 - 66.7	- 1
2.3	light	- 1	+ 40 - 60	+ 66.7 - 33.33	+ 40 - 60
2.4	flat curved	+ 75 - 25	+ 1	+ 1	+ 1
3.1	indistinct	+ 75 - 25	+ 80 - 20	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 80 - 20	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 80 - 20	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 20 - 80	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1	+ 1
4.3	rel. far apart on dist. 1/2	+ 1	+ 1	+ 1	- 1
4.4	light	+ 25 - 75	+ 20 - 80	+ 33.3 - 66.7	+ 40 - 60

5.1	irregular	+ 50 - 50	- 1	+ 66.7 - 33.3	- 1
5.2	feather and step	+ 1	+ 50 - 50	+ 50 - 50	+ 1
Total	+	+ 9.5	+ 9.3	+ 10.5	+ 9.4
	-	- 4.5	- 4.7	- 3.5	- 4.6
%	+	+ 68	66.42	+ 75	+ 67
	-	- 32	33.57	- 25	- 33
Score		+ 36	+ 32.85	+ 50	+ 34

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 50 - Sub. Indirect Percussion

Although the scar is somewhat like a hammerstone flake (flat and thin) it has the two distinctive ribs near the distal edge similar to billet flakes.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01083	Main Flake Scar # R-10	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	minimal (1)	1. Edge Unit # 2 reverse side coded from scars 9 to 18.
2.1	Edge Sharpness		intermediate to dull	
2.2	Margin Damage		heavy	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		straight	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on distal 1/2		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular	predominantly straight, some rounded	
5.2	Scar Termination at Distal Edge	feather	predominantly step, some feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C01083 Scar R10 - Main Scar

	Prehistoric C01083 R10	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion
1.1	Substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1
4.1	present	+ 80 - 20	+ 50 - 50	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	- 1	+ 1	+ 1
4.4	light	+ 40 - 60	+ 25 - 75	+ 33.3 - 66.7

5.1	irregular	- 1	+ 50 - 50	+ 66.7 - 33.3
5.2	feather	+ 40 - 60	+ 25 - 75	+ 1
Total	+	+ 6.4	+ 6.50	+ 8.0
	-	- 3.6	- 3.50	- 2.0
%	+	+ 64	+ 65	+ 80
	-	- 36	- 35	- 20
Score		+ 28	+ 30	+ 60

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 60 Sub. Indirect Percussion

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C01083 Edge Unit # 2 (Scar R10)

	Prehistoric C01083 Edge Unit # 2	AB14-16(b) Min. Perc. Shape Hammerstone	AB6-13(b) Mod. Shear Shape with P.F.	AB6-13(a) Min. Shear Shape with P.F.	AB10-1(a) Min. Rub Buffet Hammerstone	AB10-1(b) Min. Rub/Buffet Billet
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate to dull	+ 83.3 - 16.7	- 1	+ 66.7 - 33.3	+ 1	+ 1
2.2	heavy	+ 1	+ 1	- 1	+ 1	- 1
2.3	heavy	- 1	+ 1	+ 66.7 - 33.3	- 1	- 1
2.4	straight	+ 83.3 - 16.6	+ 1	+ 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	pred. straight some rounded	+ 1	+ 50 - 50	+ 50 - 50	+ 75 - 25	- 1
5.2	pred. step some feather	+ 1	+ 1	+ 50 - 50	+ 1	+ 50 - 50
Total	+	+ 5.67	+ 5.50	+ 4.33	+ 5.75	+ 3.5
	-	- 1.33	- 1.50	- 2.67	- 1.25	- 3.5
%	+	+ 81	+ 79	+ 62	+ 82	+ 50
	-	- 19	- 21	- 38	- 18	- 50
Score		+ 62	+ 58	+ 24	+ 64	0

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 64 - min. rub buffet hammerstone
Possible + 62 - min. perc. shape hammerstone
Possible + 58 - mod. shear shape with p.f.

Based on Unit 1 which is rub/buffet, this would appear to be the likely choice for this unit as well. Some slight shearing may be present on the base (scars 014 - 018).

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01083	Main Flake Scar # R-19	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	(1)	1. Edge Unit # 3 Reverse side coded from scars # 18-22. (See scar 0-12)
2.1	Edge Sharpness			
2.2	Margin Damage			2. Mostly on scars 20-21 only used to remove inter-flake ridges on larger scars.
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	distinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on distal 1/2		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R19, C01083

	Prehistoric C01083 R19	AB16-7(a)	AB7-10 Sub. Perc. Thin Billet	Ab11-11 Sub. Indirect Percussion
1.1	substantial	+1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	distinct	- 1	+ 25 - 75	+ 33.3 - 66.7
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1
4.1	present	+ 80 - 20	+ 50 - 50	+ 33.3 - 66.6
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	- 1	+ 1	+ 1
4.4	0	+ 60 - 40	+ 75 - 25	+ 66.7 - 33.3

5.1	irregular	- 1	+ 50 - 50	+ 66.7 - 33.3
5.2	feather	+ 40 - 60	+ 25 - 75	+ 1
Total	+	+ 5.60	+ 6.5	+ 8.0
	-	- 4.40	- 3.5	- 2.0
%	+	+ 56	+ 65	+ 80
	-	- 44	- 35	- 20
Score		+ 12	+ 30	+ 60

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 60 - Sub. Indirect Perc.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01083	Main Flake Scar # R23	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1) and (2)	1. Edge Unit # 1 coded from scars 1 to 7 and 22 to 26 (scar 05).
2.1	Edge Sharpness			
2.2	Margin Damage			2. Used to remove inter-flake ridges from larger scars resulting from substantial percussion flaking.
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		3. Need to rotate under light in order to observe.
3.2	Bulb to Scar Transition Angle	gradual		4. The ribs appear to be evenly dist. but the bulb of percussion has been removed - it is most probable that originally they were on the distal 1/2.
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	(3) present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	(4) rel. far apart on distal 1/2		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rel. straight		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R23, C01083

	Prehistoric C01083 Scar R23	AB5-9(b) Mod. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	moderate	+ 1	- 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 80 - 20	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 80 - 20	+ 1	+ 1
3.3	thin	+ 80 - 20	+ 1	+ 80 - 20
4.1	present	+ 20 - 80	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	+ 1	+ 1	- 1
4.4	0	+ 80 - 20	+ 66.7 - 33.3	+ 60 - 40

5.1	rel. straight	+ 60 - 40	- 1	+ 60 - 40
5.2	feather	+ 50 - 50	+ 1	+ 40 - 60
Total	+	+ 7.50	+ 6.67	+ 7.2
	-	- 2.50	- 3.33	- 2.8
%	+	+ 75	+ 67	+ 72
	-	- 25	- 33	- 28
Score		+ 50	+ 34	+ 44

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 50 Mod. Perc. Thin Billet

This scar may represent the distal portion of an originally much larger scar.

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact C01083 (Jordan)

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
05		highly probable	+ 72	sub. press. thin with p.f.	AB8-6
	Edge Unit 1	indeterminate	+ 16	min. rub buffet with hammerstone	AB10-1(b)
012		highly probable	+ 70	sub. pressure thin with p.f.	AB8-6
	Edge Unit 3	possible	+ 64	min. rub/buffet hammerstone (a small area of shearing on R15)	AB10-1(a)
024		possible	+ 42	sub. press. thin with p.f.	AB5-9
026		possible	+ 56	sub. press. thin with p.f.	AB5-9
R6		possible	+ 50	sub. indirect percussion	AB11-11
R10		possible	+ 60	sub. indirect percussion	AB11-11
	Edge Unit 2	possible	+ 64	min. rub buffet hammerstone	AB10-1(a)
R19		possible	+ 60	sub. indirect percussion	AB11-11
R23		possible	+ 60	moderate perc. thin billet	AB10-1(b)

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units: C01083

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Substantial Indirect Percussion: These flakes (R6, R10, and R19) were used to remove large face paring or thinning flakes. Production Unit Code is 40:5, 51, 51.

(b) Moderate Percussion Thin Billet: Only one flake (023) was identified for this face paring unit. Production Unit Code is 40:3, 41, 51.

3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

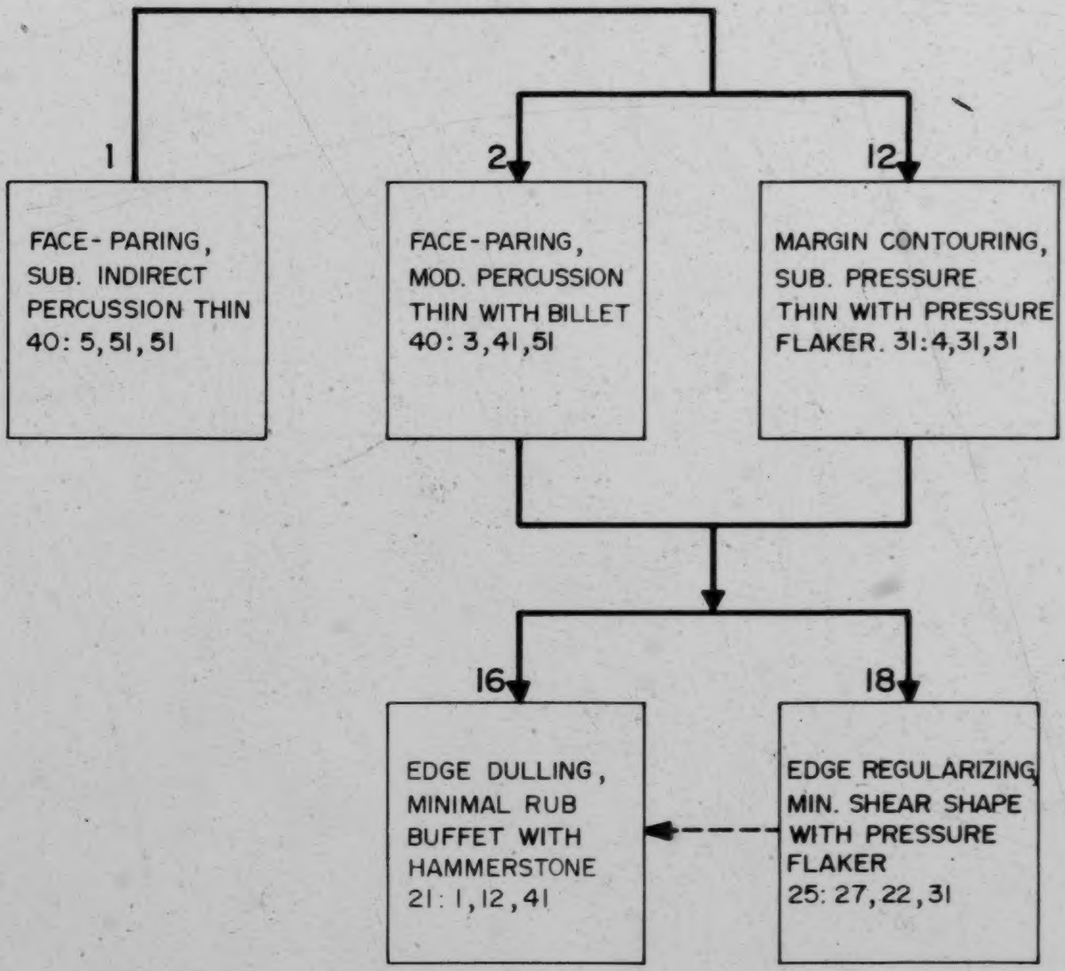
(a) Substantial Pressure Thinning with a Pressure Flaker: Scars in the vicinity of 012 and 026. In this case the function of the face paring was to contour the margin and create or increase the edge angle on the flat flake core surface to make a bifacial instead of a unifacial edge. Production Unit Code is 31:4, 42, 51.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

Edge units, because of their limited number of morphological attributes which are often very similar, are hard to identify in some cases. On this specimen, Edge Unit #1 has been identified as min. rub/buffet with a hammerstone, production unit code 20-1-12-41. Edge Unit 2 has also been identified as min. rub/buffet hammerstone. Some shearing may also be present especially on scars 014-018. Production Unit Code is 21:1, 20, 31. Finally, edge unit 3 has been identified as min. rub buffet hammerstone - Production Unit Code is 20:1, 12, 41 (same as 1 & 2 above).

Shearing units are used to strengthen, reduce and center the edge of the artifact all in one movement around the edge from one face to another utilizing a pressure flaker (scars R14, 15, 18).

Rub buffet units consist of dragging the tool such as a hammerstone or billet across the edge of the artifact. This blunts the edge and strengthens the platforms. Flat scars with little overlapping are removed (i.e., scars R2, R7).


1
FACE- PARING, SUB. INDIRECT PERCUSSION THIN 40: 5, 51, 51
2
FACE-PARING, MOD. PERCUSSION THIN WITH BILLET 40: 3,41,51
12
MARGIN CONTOURING, SUB. PRESSURE THIN WITH PRESSURE FLAKER. 31:4,31,31
16
EDGE DULLING, MINIMAL RUB BUFFET WITH HAMMERSTONE 21: 1,12,41
18
EDGE REGULARIZING, MIN. SHEAR SHAPE WITH PRESSURE FLAKER 25: 27,22,31

(b) Reconstructing Sequencing of Production Units: C01083

3.4 Flow Diagram of Production Units (above)

3.5 Description and Discussion of Technological Grammar Found on Artifact

The prehistoric biface was manufactured from a large flake with only one large remnant scar (O-23) remaining from the original flake core.

The obverse side of the artifact has at least one moderate billet percussion shaping flake which is likely a remnant left from an earlier stage of manufacture. The billet work was followed by substantial pressure thinning on the obverse face as evident from scars O8, O9, O11, O12, O13, O26, etc., which was used to contour the margin by increasing the edge angle and creating a bifacial edge on the flake core.

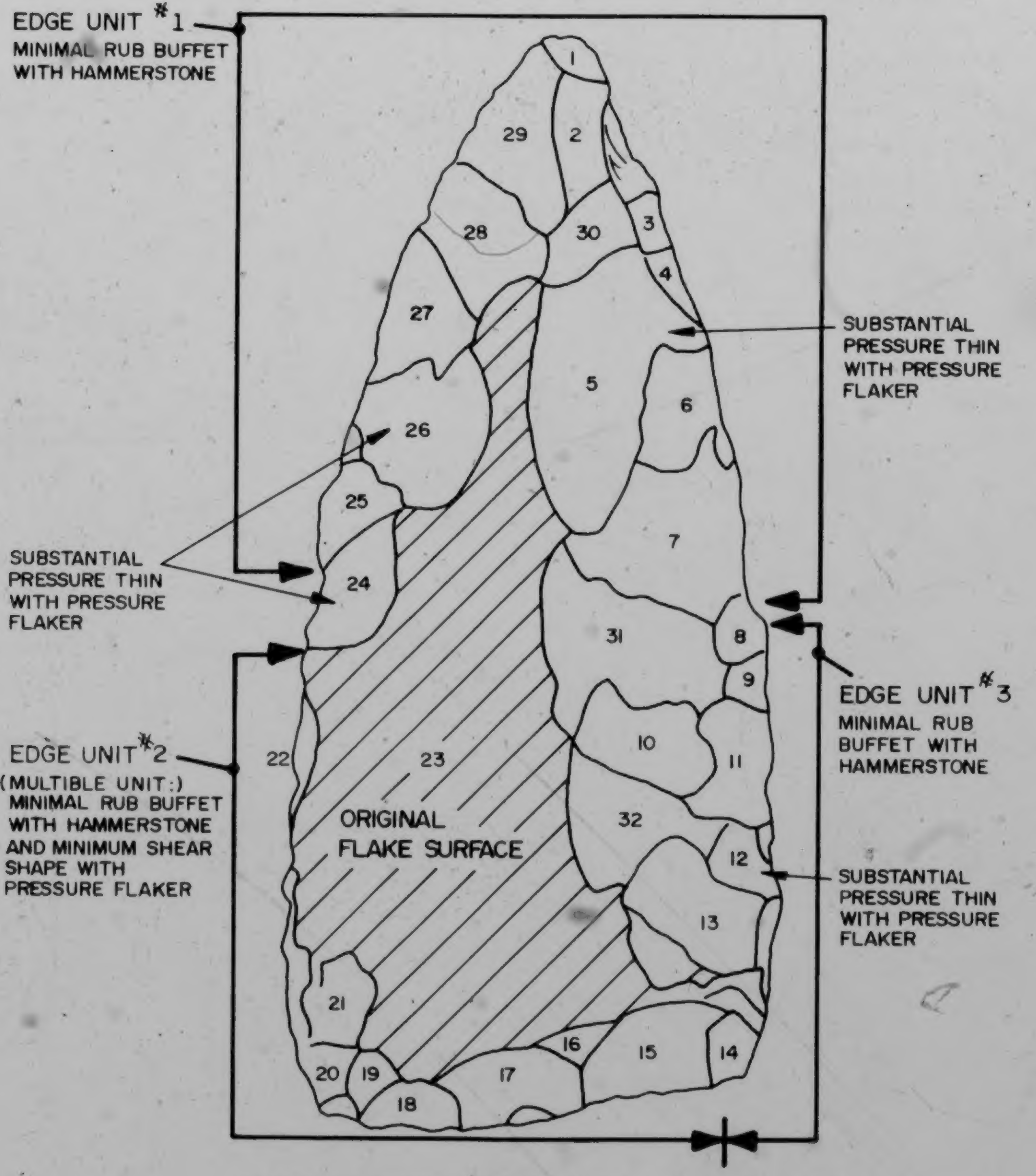
On the reverse face where a larger amount of face paring was needed, substantial indirect percussion was used to remove large thinning flakes (scars R6, R10, R19). Some earlier billet thinning work is also present on this face (i.e., scar R23).

The artifact margins were blunted and strengthened by means of a rub/buffet with possibly a small hammerstone. This strengthened the edge. Regularizing and centering of the edge was accomplished with a shearing movement around the edge from one face to another, primarily on the base, utilizing a pressure flaker.

DeHa -8 — CO 1083

OBVERSE FACE

FIGURE 34


EDGE UNIT #1
MINIMAL RUB BUFFET WITH HAMMERSTONE
SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
EDGE UNIT #2
(MULTIBLE UNIT:) MINIMAL RUB BUFFET WITH HAMMERSTONE AND MINIMUM SHEAR SHAPE WITH PRESSURE FLAKER
EDGE UNIT #3
MINIMAL RUB BUFFET WITH HAMMERSTONE
SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
ORIGINAL FLAKE SURFACE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
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32

SCARS SELECTED FOR ANALYSIS No.'s 5, 24, & 26.

0 5 10 20mm

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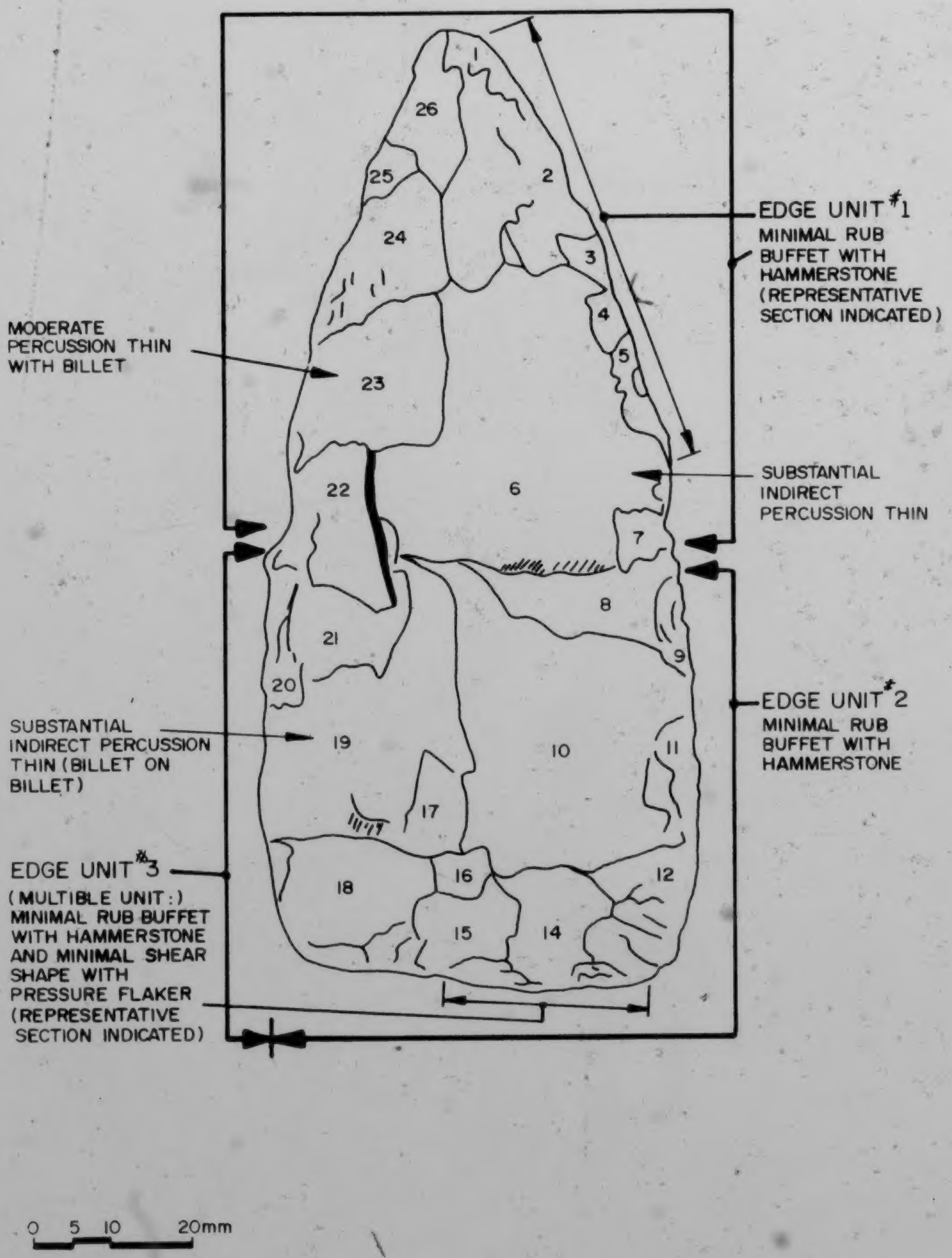
REVERSE FACE

FIGURE 35



1
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22
23
24
25
26
EDGE UNIT #1
MINIMAL RUB BUFFET WITH HAMMERSTONE (REPRESENTATIVE SECTION INDICATED)
MODERATE PERCUSSION THIN WITH BILLET
SUBSTANTIAL INDIRECT PERCUSSION THIN
EDGE UNIT #2
MINIMAL RUB BUFFET WITH HAMMERSTONE
SUBSTANTIAL INDIRECT PERCUSSION THIN (BILLET ON BILLET)
EDGE UNIT #3
(MULTIBLE UNIT:) MINIMAL RUB BUFFET WITH HAMMERSTONE AND MINIMAL SHEAR SHAPE WITH PRESSURE FLAKER (REPRESENTATIVE SECTION INDICATED)
0 5 10 20mm

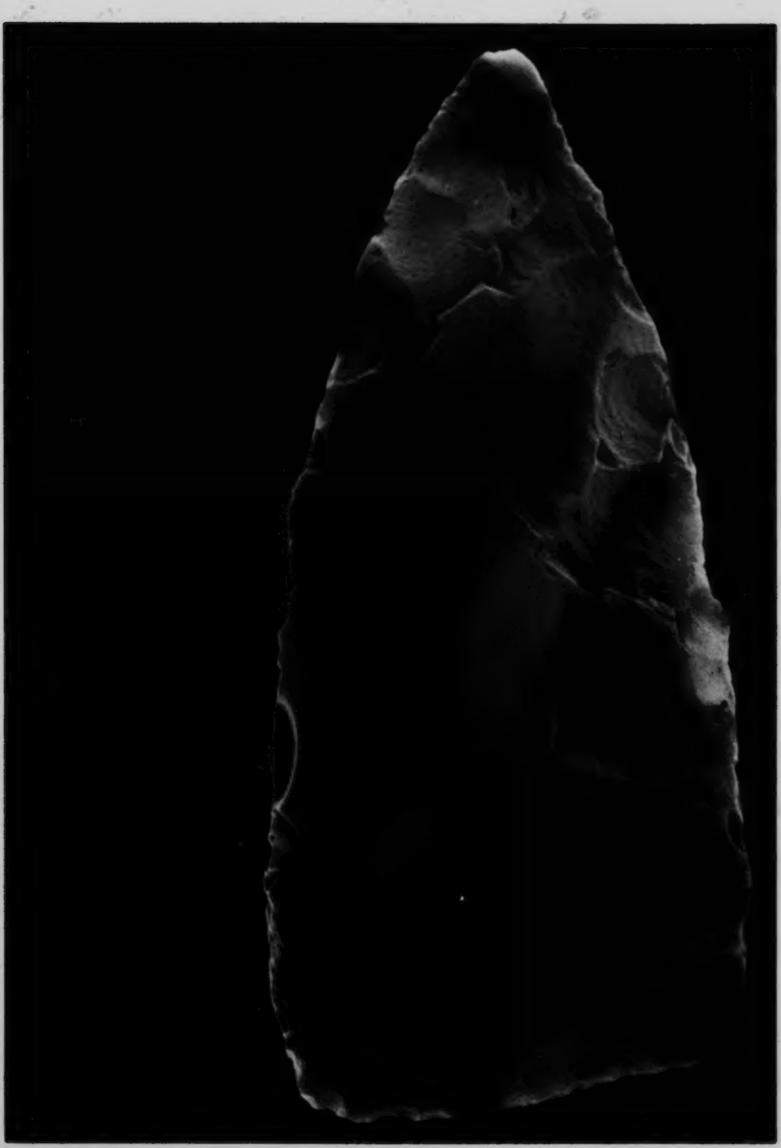


Plate 44: Prehistoric Artifact C01083, Obverse Face.

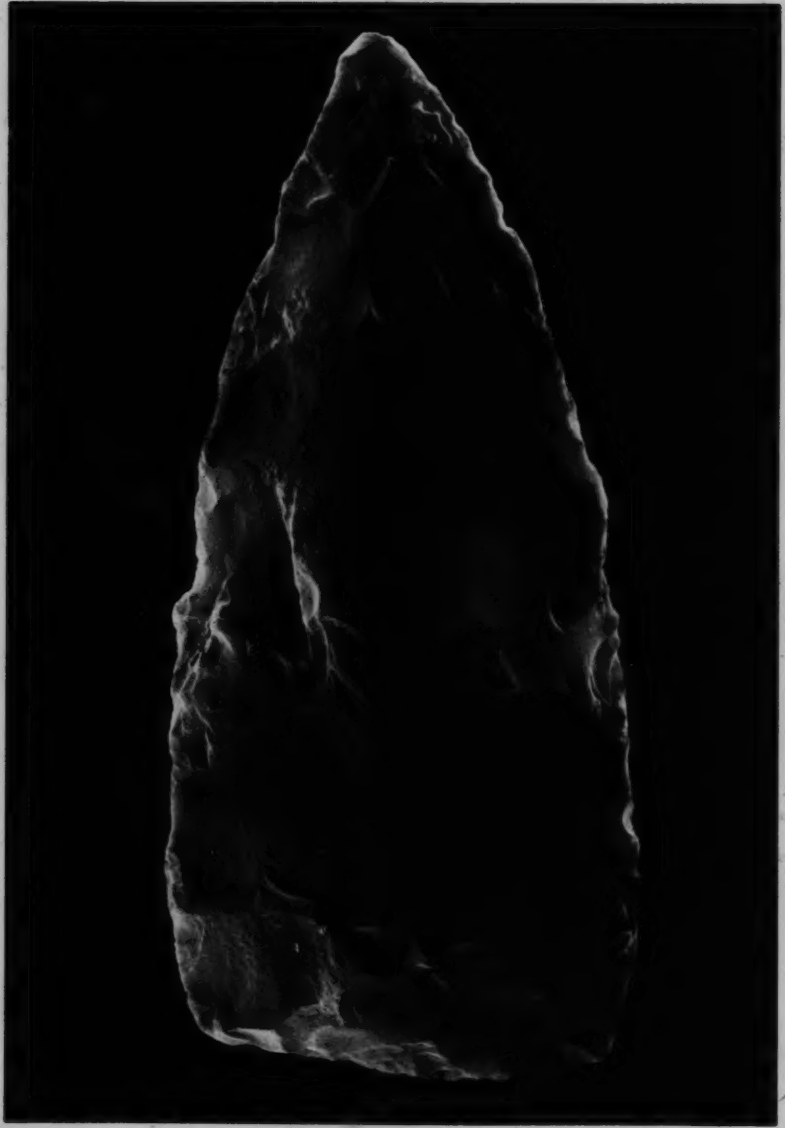


Plate 45: Prehistoric Artifact C01083, Reverse Face.

Table 60: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: DeHa-8, Jordan Site

1.3 Specimen Catalogue #: C01085

1.4 Photographic Plate Identification: Roll 2 B3 #34A and
Roll 3 B3 #24

1.5 Standard Artifact Description:

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: Biface

1.8 Flaking (Bifacial/Unifacial): Bifacial

1.9 Metric Size: length - 11.0 cm
width - 5.0 cm
thickness - 1.2 cm

1.10 Form/Morphology Description:

This specimen is a preform or rough out of a broad lanceolate shaped biface with a distinctive convex base. It is manufactured from a bifacially retouched flake-core and several original flake-core surfaces remain intact. Notable on the specimen are two areas of distinctive platform crushing and the grinding along the lateral sides. The base, however, has a sharp edge.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01085	Main Flake Scar # 07	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	(1) minimal	1. Edge Unit # 1 coded from scars 1 to 9 on obverse face and scars 18-23 reverse face. (See scar R25)
2.1	Edge Sharpness		intermediate to sharp	
2.2	Margin Damage		heavy	
2.3	Microflakes		heavy	2. Need to rotate under light in order to see ribs.
2.4	Proximal Edge Morphology		straight with convex projections	3. This scar took off much more material than probably was intended.
3.1	Negative Bulb of Force	indistinct (4)		
3.2	Bulb to Scar Transition Angle	gradual		4. Main percussion bulb area has been removed.
3.3	Flake Thickness	thick (3)		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	(2) indistinct		
4.3	Rib Spacing And Distribution	far apart on distal 1/2		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded	straight and rounded	
5.2	Scar Termination at Distal Edge	feather and step	step and feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 07, C01085

	Prehistoric C01085 Scar 07	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	- 1
4.1	0	+ 20 - 80	+ 50 - 50	+ 33.3 - 66.6
4.2	n/a	n/a	n/a	+ 1
4.3	n/a	n/a	n/a	+ 1
4.4	light	+ 40 - 60	+ 25 - 75	+ 33.3 - 66.7

5.1	rounded	+ 40 - 60	+ 50 - 50	+ 33.3 - 66.7
5.2	feather and step	+ 1	+ 1	+ 50 - 50
Total	+	+ 5.8	+ 5.25	+ 6.17
	-	- 2.2	- 2.75	- 3.83
%	+	+ 72.5	+ 66	+ 62
	-	- 27.5	- 34	- 38
Score		+ 45.0	+ 32	+ 24

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 45.0 Mod./Sub. Perc. Thin Hammerstone

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar C01085 Edge Unit # 1

	Prehistoric C01085 Edge Unit 1	AB14-16(b) Min. Perc. Shape Hammerstone	AB10-1 Min. Rub/Buffet Hammerstone	AB10-1(b) Min. Rub/Buffet Billet	AB2-2(b) Min. Press. Rub With P.F.	AB6-13(b) Mod. Shear Shape with P.F.
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate to sharp	+ 1	+ 1	+ 1	+ 50 - 50	- 1
2.2	heavy	+ 1	+ 1	- 1	+ 1	+ 1
2.3	heavy	- 1	- 1	- 1	+ 1	+ 1
2.4	straight with convex project	+ 83.3 - 16.6	+ 1	+ 1	+ 84 - 16	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight and rounded	+ 1	+ 75 - 25	- 1	+ 1	+ 50 - 50
5.2	step and feather	+ 1	+ 1	+ 50 - 50	+ 1	+ 1
Total	+	+ 5.83	+ 5.75	+ 3.5	+ 6.34	+ 5.50
	-	- 1.17	- 1.25	- 3.5	- .66	- 1.50
%	+	+ 83	+ 82	+ 50	+ 91	+ 79
	-	- 17	- 18	- 50	- 9	- 21
Score		+ 66	+ 64	0	+ 82	+ 58

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 82 Minimum Pressure Rub with P.F.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01085	Main Flake Scar # 011	Edge Treatment on Same Scar	Notes
1.1	Scar Size	minimum	very minimum to minimum (1)	1. Edge Unit 2 Coded from scars 10-13 obverse face and scars 15-17 reverse face. It is probable that the reverse face served as the platform for the unit. 2. Very hard to see except under a strong light.
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		heavy	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		straight with some flat curved notches and convex projections	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	(2) present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight	pred. straight	
5.2	Scar Termination at Distal Edge	step	pred. step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 011, C01085

	Prehistoric C01085 Scar 011	AB5-9(a) Minimum Perc. Thin Billet	AB9-5(b) Min. Press. Thin with P.F.	AB16-7(b) Min. Perc. Thin Hammerstone	AB3-17 Mod. Perc. Shape/Hammerstone
1.1	minimum	+ 1	+ 1	+ 1	+ 66.7 - 33.3
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 1	+ 1	+ 1	+ 1
3.2	gradual	+ 1	+ 1	+ 1	+ 1
3.3	thin	+ 88.9 - 11.1	+ 1	+ 1	+ 1
4.1	present	- 1	+ 22.2 - 77.8	- 1	+ 33.3 - 66.7
4.2	indistinct	n/a	+ 1	n/a	+ 1
4.3	rel. far apart & evenly dist.	n/a	- 1	n/a	+ 1
4.4	0	+ 1	+ 1	+ 1	+ 66.7 - 33.3

5.1	straight	+ 22 - 78	+ 55.6 - 44.4	+ 50 - 50	+ 1
5.2	step	+ 44.5 - 55.5	+ 22.2 - 77.8	+ 16.6 - 83.4	+ 1
Total	+	+ 5.56	+ 7.0	+ 5.67	+ 8.67
	-	- 2.44	- 3.0	- 2.33	- 1.33
%	+	+ 70	+ 70	+ 71	+ 87
	-	- 30	- 30	- 29	- 13
Score		+ 40	+ 40	+ 42	+ 74

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 74 Mod. Perc. Shape Hammerstone

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar C01085, Edge Unit 2 (Coded on Scar 011 Form)

	Prehistoric C01085 Edge Unit 2	AB6-13(b) Mod. Shear Shape with P.F.	AB5-9(a) Min. Perc. Thin Billet	AB15-18(b) Min. Perc. Shape Billet	AB2-2(b) Min. Press. Rub with P.F.	AB16-7(b) Min. Perc. Thin Hammerstone
1.1	very minimum to minimum	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 1	+ 1
2.2	heavy	+ 1	+ 1	+ 1	+ 1	+ 66 - 34
2.3	heavy	+ 1	+ 1	+ 80 - 20	+ 1	+ 50 - 50
2.4	straight convex project	+ 1	+ 1	+ 1	+ 84 - 16	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	pred. straight	+ 44 - 56	+ 22 - 88	+ 80 - 20	+ 50 - 50	+ 50 - 50
5.2	pred. step	+ 22.3 - 77.7	+ 44.5 - 55.5	+ 20 - 80	+ 50 - 50	+ 16.6 - 83.4
Total	+	+ 5.67	+ 5.67	+ 5.80	+ 5.84	+ 4.83
	-	- 1.33	- 1.33	- 1.20	- 1.16	- 2.17
%	+	+ 81	+ 81	+ 83	+ 83	+ 69
	-	- 19	- 19	- 17	- 17	- 31
Score		+ 62	+ 62	+ 66	+ 66	+ 38

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Scores too close together to identify - may be shear shaping or pressure rub as these are present elsewhere on the artifact.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01085	Main Flake Scar # 025	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very sub.	minimal (1)	1. Edge Unit 3 coded from obverse face scars 14-22 and reverse face scars 1-14 (See scar #R13)
2.1	Edge Sharpness		intermediate to sharp	
2.2	Margin Damage		heavy (2)	
2.3	Microflakes		heavy	2. Two areas have extensively crushed platforms similar to failed areas on experimental specimen AB6-13 side b mod. shear shape with P.F.
2.4	Proximal Edge Morphology		follows exist. edge - straight	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		3. Too much of the original percussion bulb and platform are missing to code rib distribution.
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	n/a (3)		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular	straight & irregular	
5.2	Scar Termination at Distal Edge	feather	step and feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 025, C01025

	Prehistoric C01025 Scar 025	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion	AB16-7(a) Sub./Mod. Perc. Thin Hammerstone
1.1	very sub.	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	n/a	n/a	n/a	n/a
4.4	light	+ 25 - 75	+ 33.3 - 66.7	+ 40 - 60

5.1		irregular	+ 50 - 50	+ 66.7 - 33.3	- 1
5.2		feather	+ 25 - 75	+ 1	+ 40 - 60
Total	+		+ 5.5	+ 7	+ 6.40
	-		- 3.5	- 2	- 2.60
%	+		+ 61	+ 78	+ 71
	-		- 39	- 22	- 29
Score			+ 22	+ 56	+ 42

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 56 Sub. Indirect Percussion

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar C01025, Edge Unit #3

	Prehistoric C01025 Edge Unit 3	AB14-16(b) Min. Per. Shape Hammerstone	AB6-13(a) Min. Shear Shape P.F.	AB6-13(b) Mod./Sub. Shear Shape P.F.	AB10-1(a) Min. Rub/Buffet Hammerstone	AB2-2(b) Min. Press. Rub with P.F.
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate to sharp	+ 1	+ 1	- 1	+ 1	+ 50 - 50
2.2	heavy	+ 1	- 1	+ 1	+ 1	+ 1
2.3	heavy	- 1	+ 66.7 - 33.3	+ 1	- 1	+ 1
2.4	follows edge straight	+ 83.3 - 16.6	+ 1	+ 1	+ 1	+ 84 - 16
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight and irregular	+ 33.3 - 66.7	+ 1	+ 1	+ 75 - 25	+ 50 - 50
5.2	step and feather	+ 1	+ 1	+ 1	+ 1	+ 1
Total	+	+ 5.16	+ 5.67	+ 6	+ 5.75	+ 5.84
	-	- 1.84	- 1.33	- 1	- 1.25	- 1.16
%	+	+ 74	+ 81	+ 86	+ 82	+ 83
	-	- 26	- 19	- 14	- 18	- 17
Score		+ 48	+ 62	+ 72	+ 64	+ 66

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 72 Mod./Sub. Shear Shape with P.F.
(see scars R4 to R11)

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01085	Main Flake Scar # R13	Edge Treatment on Same Scar	Notes
1.1	Scar Size	sub.	(1)	1. Edge Unit 3 coded from reverse face scars 1-14 and obverse face scars 14-22. (See scar 0-25)
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R13, C01085

	Prehistoric C01085 R13	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion
1.1	sub.	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33,3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1
4.1	0	+ 20 - 80	+ 50 - 50	+ 66.7 - 33.3
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 60 - 40	+ 75 - 25	+ 66.7 - 33.3

5.1		rounded	+ 40 - 60	+ 50 - 50	+ 33.3 - 66.7
5.2		feather	+ 40 - 60	+ 25 - 75	+ 1
Total	+		+ 5.4	+ 5.0	+ 6.33
	-		- 2.6	- 3.0	- 1.67
%	+		+ 68	+ 63	+ 79
	-		- 32	- 37	- 21
Score			+ 36	+ 26	+ 58

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 58 Sub. Indirect Percussion

This scar represents the distal end remnant portion of a much larger scar (note the extreme scar width at the edge). Therefore, the identification is based on a partial morphology only.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

Artifact # C01085	Main Flake Scar # R18	Edge Treatment on Same Scar	Notes
1.1 Scar Size	sub.	(1)	1. See scar R25 for edge unit for this scar.
2.1 Edge Sharpness			
2.2 Margin Damage			2. This scar was produced by the same production unit as scar R25.
2.3 Microflakes			
2.4 Proximal Edge Morphology			
3.1 Negative Bulb of Force	indistinct (2)		
3.2 Bulb to Scar Transition Angle	gradual		
3.3 Flake Thickness	thin		
4.1 Presence or Absence of Ribs	0		
4.2 Distinctiveness of Ribs	n/a		
4.3 Rib Spacing And Distribution	n/a		
4.4 Tearing	0		
5.1 Scar Shape at Distal Edge	straight		
5.2 Scar Termination at Distal Edge	step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R18, C01085

	Prehistoric C01085 R18	AB7-10 Sub. Perc. Thin Billet	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 75 - 25	+ 1	+ 80 - 20
3.2	gradual	+ 75 - 25	+ 1	+ 80 - 20
3.3	thin	+ 50 - 50	+ 80 - 20	+ 80 - 20
4.1	0	+ 50 - 50	+ 20 - 80	+ 80 - 20
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 75 - 25	+ 60 - 40	+ 80 - 20

5.1		straight	- 1	+ 60 - 40	+ 60 - 40
5.2		feather	+ 25 - 75	+ 40 - 60	+ 50 - 50
Total	+		+ 4.5	+ 5.6	
	-		- 3.5	- 2.4	
%	+		+ 56.2	+ 70.0	
	-		- 43.8	- 30.0	
Score			+ 12.2	+ 40.0	

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 40 Mod./Sub. Perc. Thin Hammerstone

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01085	Main Flake Scar # R25	Edge Treatment on Same Scar	Notes
1.1	Scar Size	sub.	(1)	1. Edge Unit 1 code from scars 18-23 reverse face and scars 1-9 obverse face. (See scar 07) 2. Production unit the same as scar R18.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct (2)		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	0		
4.3	Rib Spacing And Distribution	0		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R25, C01085

	Prehistoric C01085 Scar R25	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1
4.1	0	+ 20 - 80	+ 50 - 50	+ 66.6 - 33.3
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 60 - 40	+ 75 - 25	+ 66.7 - 33.3

5.1	straight	+ 40 - 60	- 1	- 1
5.2	step	+ 60 - 40	+ 75 - 25	- 1
Total	+	+ 5.6	+ 5.0	+ 5
	-	- 2.5	- 3.0	- 3
%	+	+ 70	+ 62.5	+ 62.5
	-	- 30	- 37.5	- 37.5
Score		+ 40	+ 35.0	+ 35.0

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 40 Mod./Sub. Perc. Thin Hammerstone

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact C01085

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
07		possible	+ 45.0	Mod./Sub. Percussion Thin Hammerstone	AB16-7(a)
	Edge Unit # 1	highly probable	+ 82	Minimum Pressure Rub with P.F.	AB2-2(b)
011		highly probable	+ 74	Moderate Percussion Shape Hammerstone	AB3-17
	Edge Unit # 2	n/a	n/a	Scores too close together to identify	
025		possible	+ 56	Sub. Indirect Percussion	AB11-11
	Edge Unit # 3	highly probable	+ 72	Mod./Sub. Shear Shape with P.F. (see scars R4 to R11)	AB6-13(b)
R13		possible	+ 58	Sub. Indirect Percussion	AB11-11
R18		possible	+ 40	Mod./Sub. Perc. Thin Hammerstone	AB16-7(a)
R25		possible	+ 40	Mod./Sub. Perc. Thin Hammerstone	AB16-7(a)

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units:

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Substantial Indirect Percussion Thin Identification scars 025, R13: This unit is used for face paring (thinning flakes). Production Unit Code 40:5, 51, 51.

(b) Substantial Percussion Thin with Hammerstone: This behavior unit was used on the prehistoric specimen for face paring or substantial thinning of the artifact. Production Unit Code 40:4, 41, 41.

(c) Moderate Percussion Shape with Hammerstone: These behavior units were used on the base of the specimen to move in the margin of the artifact (i.e., to control the outline shape of the artifact rather than just thin it). Production Unit Code 33:3, 42, 41.

3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

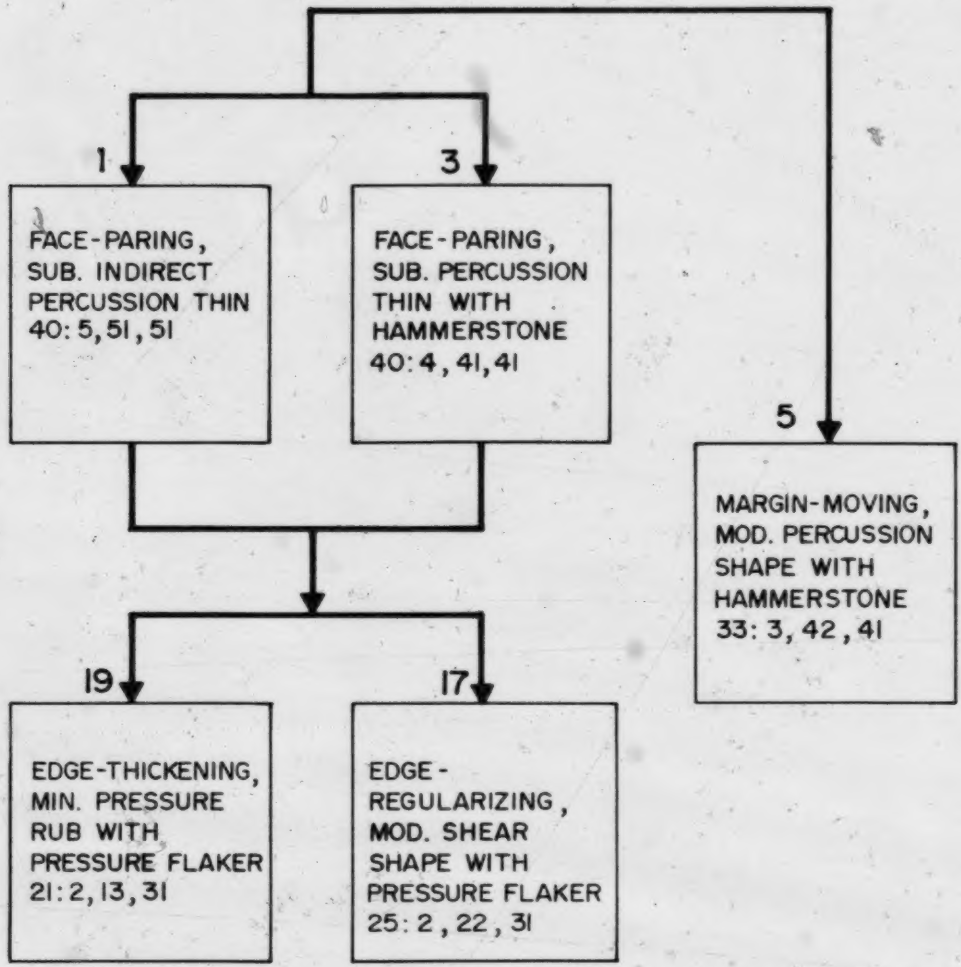
There are no pressure thin or shape units on this specimen.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

Two edge units are identified:

(a) Minimum Pressure Rub with P.F.: This behavior unit was used to remove a thin edge and thicken/strengthen it prior to removal of further thinning/shaping flakes. A pressure rub removes a relatively small amount of material from the edge. Production Unit Code is 21:2, 13, 31. (Edge unit # 1).

(b) Moderate/Substantial Shear Shape with Pressure Flaker: This behavior unit was used to straighten, center, reduce and strengthen the edge by means of a shearing movement around the edge from one face to another. Production Unit 23/25:2, 22, 31. Although edge unit # 2 could not be identified due to the scores being too close together it is possible that it is either a minimum shear or a minimum pressure rub as these units are represented elsewhere on the specimen.


1
FACE-PARING, SUB. INDIRECT PERCUSSION THIN 40: 5, 51, 51
3
FACE-PARING, SUB. PERCUSSION THIN WITH HAMMERSTONE 40: 4, 41, 41
5
MARGIN-MOVING, MOD. PERCUSSION SHAPE WITH HAMMERSTONE 33: 3, 42, 41
19
EDGE-THICKENING, MIN. PRESSURE RUB WITH PRESSURE FLAKER 21: 2, 13, 31
17
EDGE-REGULARIZING, MOD. SHEAR SHAPE WITH PRESSURE FLAKER 25: 2, 22, 31

(b) Reconstructing Sequencing of Production Units: C01085

3.4 Flow Diagram of Production Units (above)

3.5 Description and Discussion of Technological Grammar Found on Artifact

This prehistoric biface rough out or preform was manufactured from a large flake of which only a small remnant area remains (see scar 023). This flake core was thinned utilizing substantial percussion thinning with a billet. Shaping of the convex base area was accomplished by moderate and substantial hammerstone shaping flakes which moved a portion of the margin on both faces at the same time, therefore substantially changing the outline form in the base area to produce the desired convex shape. As the artifact was by no means finished and because of the need to remove further thining ahd shaping flakes, the same edges (edge units 2 & 3) were straightened, centered, reduced and strengthened by means of a moderate to substantial shear shape with the tip of a pressure flaker. Another edge (edge unit 1) perhaps did not require as much edge work and here the pressure flaker was used to rub the edge of the artifact to blunt and strengthen it. At this point the biface preform is complete and ready for final thinning and shaping.

DeHa-8 — CO 1085

OBVERSE FACE

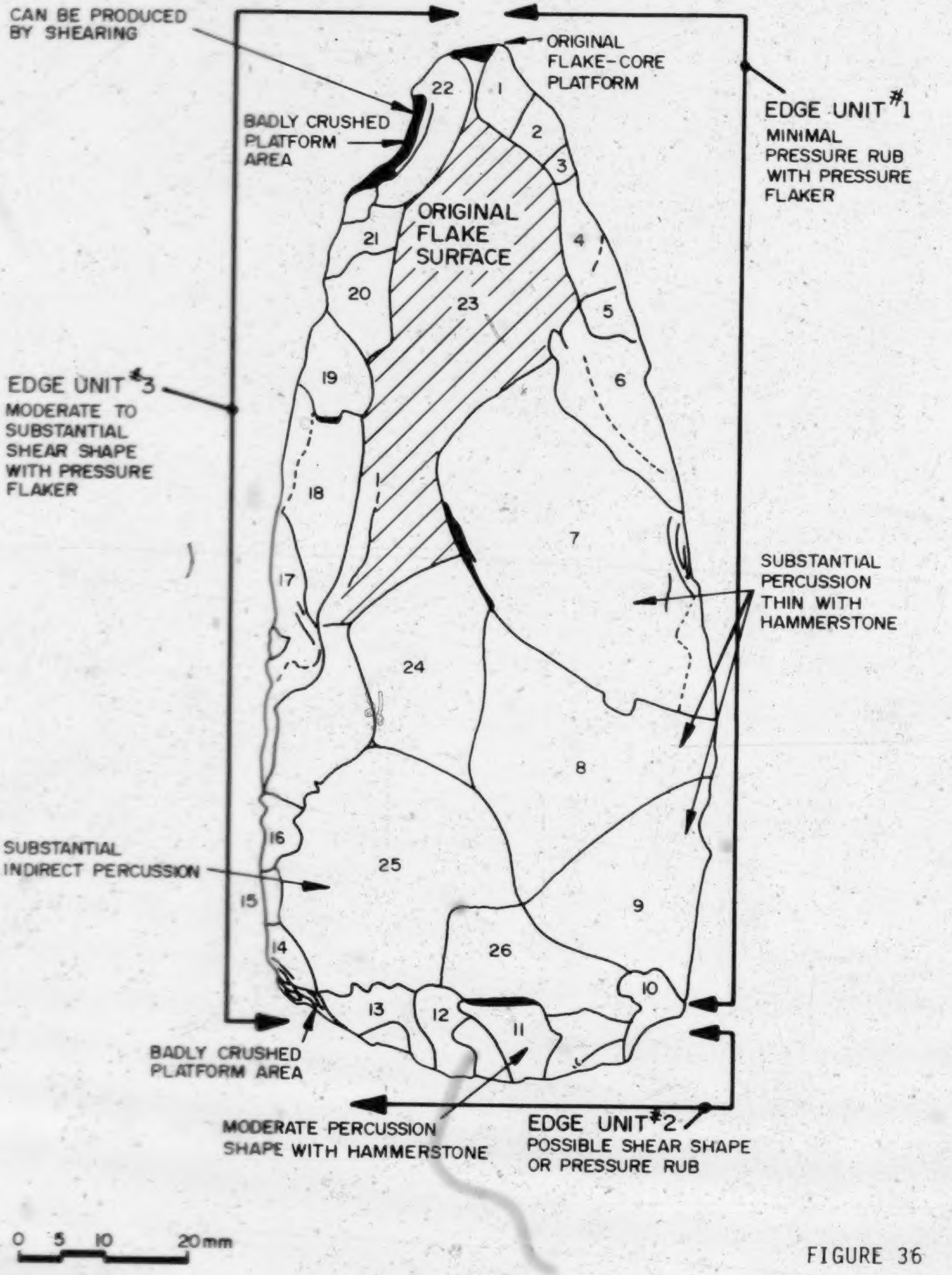

CAN BE PRODUCED BY SHEARING
ORIGINAL FLAKE-CORE PLATFORM
BADLY CRUSHED PLATFORM AREA
EDGE UNIT #1
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
ORIGINAL FLAKE SURFACE
EDGE UNIT #3
MODERATE TO SUBSTANTIAL SHEAR SHAPE WITH PRESSURE FLAKER
SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
SUBSTANTIAL INDIRECT PERCUSSION
BADLY CRUSHED PLATFORM AREA
MODERATE PERCUSSION SHAPE WITH HAMMERSTONE
EDGE UNIT #2
POSSIBLE SHEAR SHAPE OR PRESSURE RUB
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
0 5 10 20mm

FIGURE 36

DeHa-8 — CO 1085

REVERSE FACE

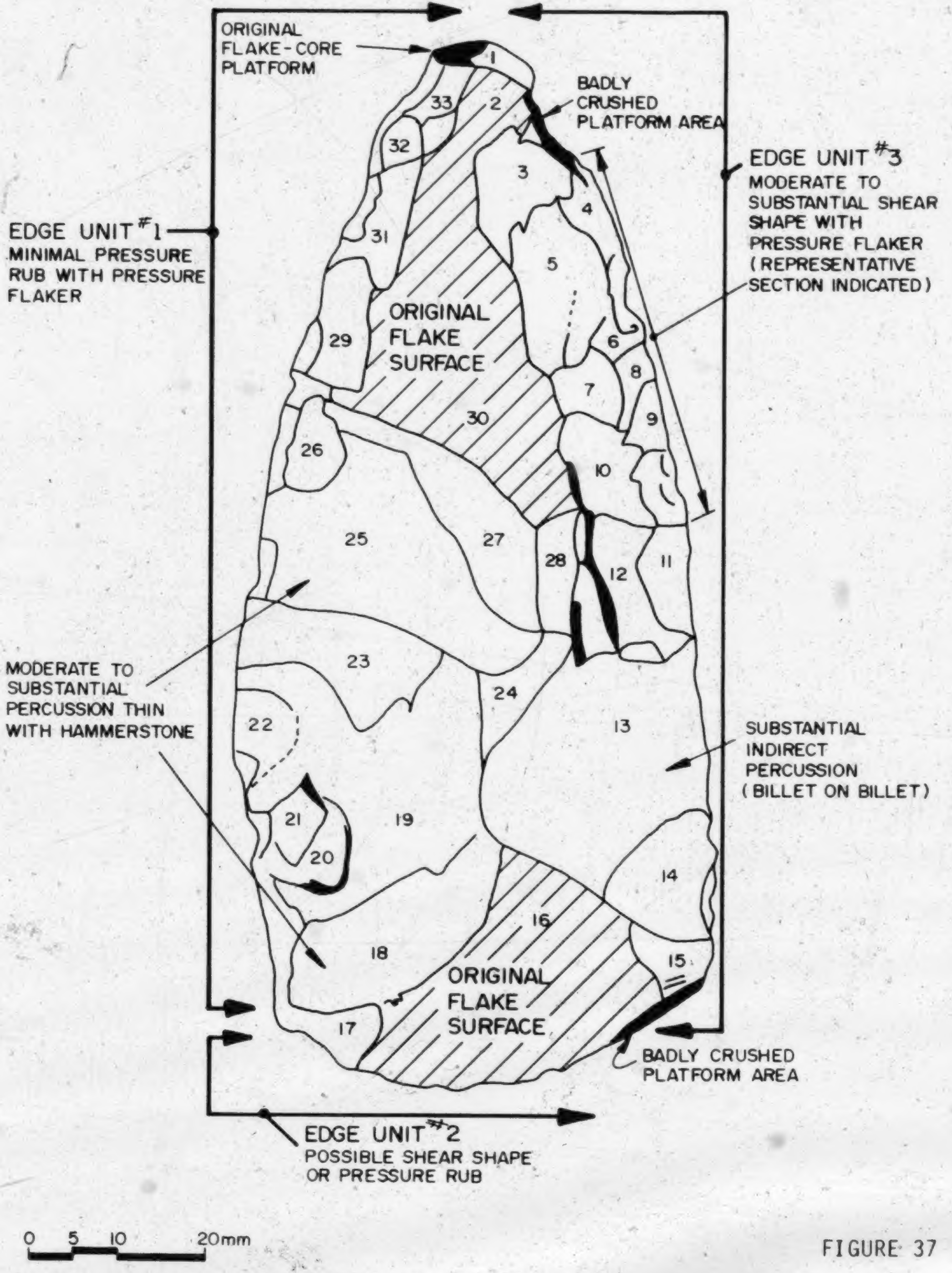

ORIGINAL FLAKE-CORE PLATFORM
BADLY CRUSHED PLATFORM AREA
EDGE UNIT #3
MODERATE TO SUBSTANTIAL SHEAR SHAPE WITH PRESSURE FLAKER (REPRESENTATIVE SECTION INDICATED)
EDGE UNIT #1
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
ORIGINAL FLAKE SURFACE
MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
SUBSTANTIAL INDIRECT PERCUSSION (BILLET ON BILLET)
ORIGINAL FLAKE SURFACE
BADLY CRUSHED PLATFORM AREA
EDGE UNIT #2
POSSIBLE SHEAR SHAPE OR PRESSURE RUB
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
0
5
10
20mm

FIGURE 37

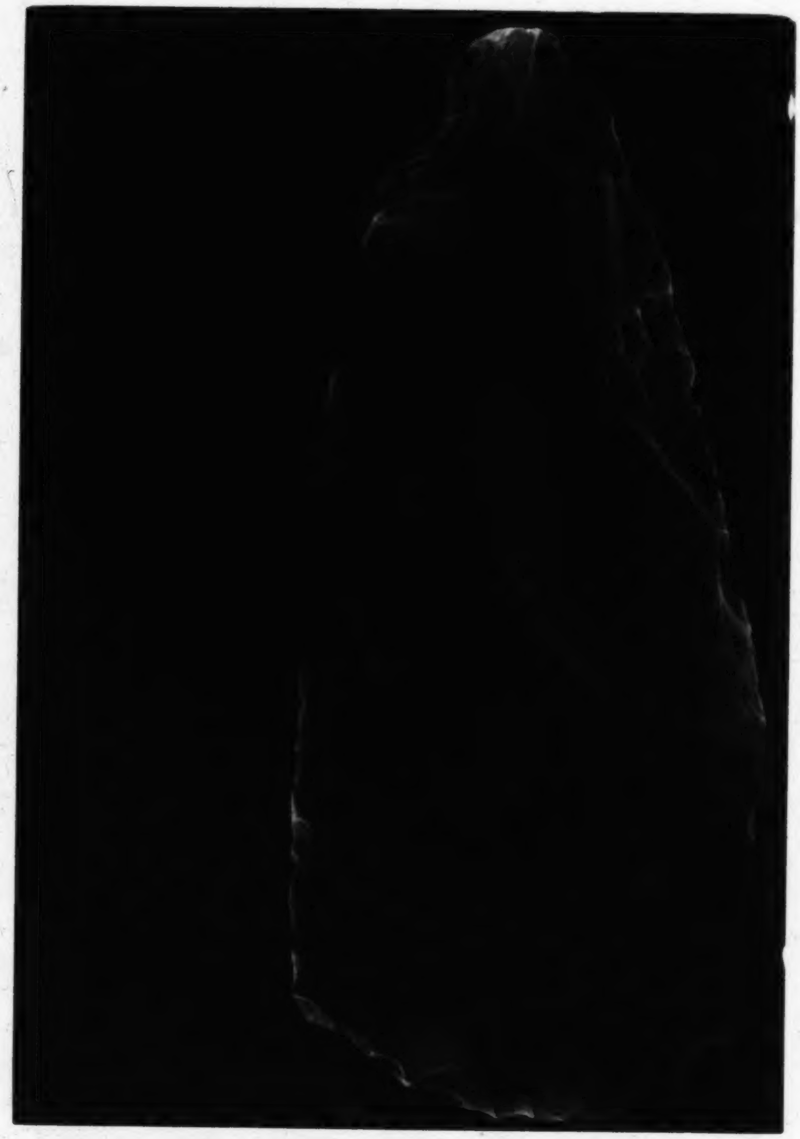


Plate 46: Prehistoric Artifact C01085, Obverse Face.

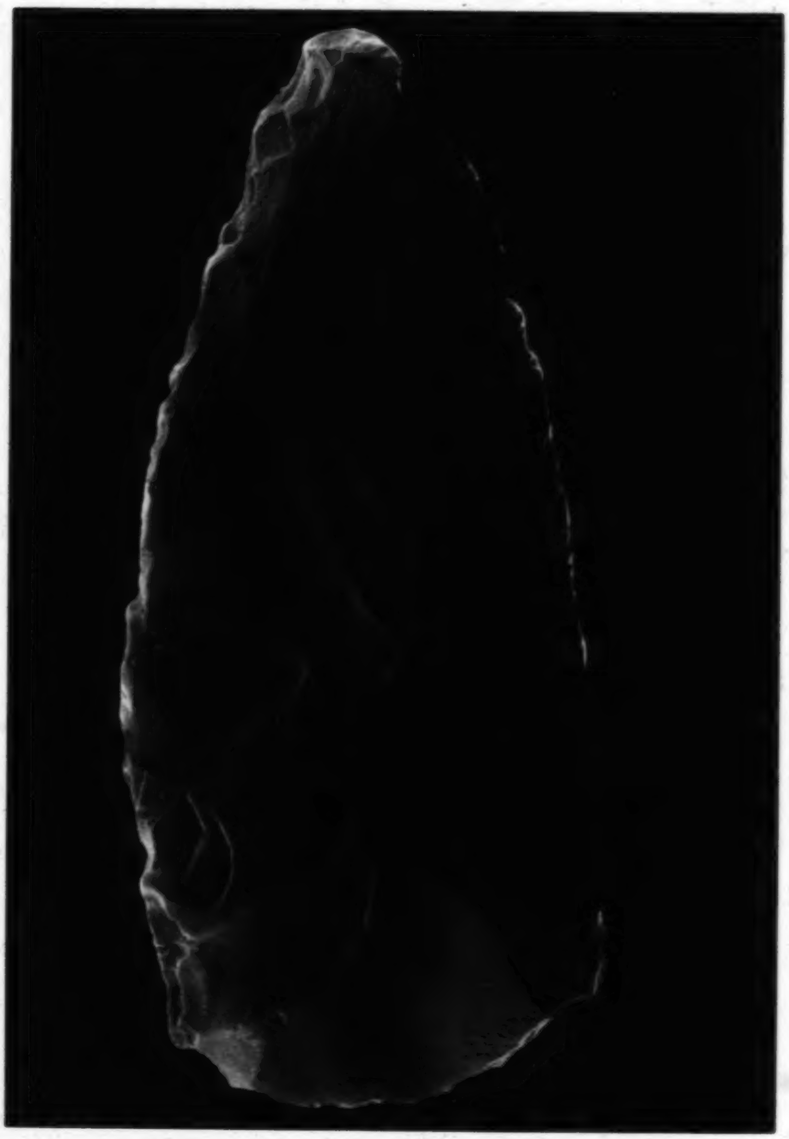


Plate 47: Prehistoric Artifact C01085, Reverse Face.

Table 61: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: DeHa-8

1.3 Specimen Catalogue #: C01079

1.4 Photographic Plate Identification: Roll 4, A5, #34

1.5 Standard Artifact Description:

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: Biface

1.8 Flaking (Bifacial/Unifacial): Bifacial

1.9 Metric Size:
length - 10.2 cm
width - 4.2 cm
thickness - 1.1 cm

1.10 Form/Morphology Description:

This is a well shaped lanceolate biface with thinning and retouch flakes present on both the obverse and reverse faces. It is a broad specimen (4.2 cm) and has a broad but slightly convex base exhibiting several thinning scars on the obverse face. No original cortex or core surfaces remain on this artifact.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01079	Main Flake Scar # 06	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate to sub	(1) very minimal to minimal (1)	1. Covers Edge Unit 1 (edge treatment for all scars, all faces).
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		light	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		straight with some convex projections	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded	straight and rounded	
5.2	Scar Termination at Distal Edge	feather	step and feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 06, Main Scar, C01079

	Prehistoric C01079 Scar 06	AB7-10 Sub. Perc. Thin Billet	AB12-19 Sub. Perc. Shape Billet	AB5-9(b) Mod. Perc. Thin Billet	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB15-18(a) Mod. Perc. Shape Billet
1.1	mod. to sub.	+ 1	+ 1	+ 1	+ 1	+ 1
2.1						
2.2						
2.3						
2.4						
3.1	indistinct	+ 75 - 25	+ 1	+ 80 - 20	+ 1	+ 85.72 - 14.28
3.2	gradual	+ 75 - 25	+ 1	+ 80 - 20	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 75 - 25	+ 80 - 20	+ 80 - 20	+ 85.72 - 14.28
4.1	0	+ 50 - 50	+ 75 - 25	+ 80 - 20	+ 20 - 80	+ 85.72 - 14.28
4.2	n/a	n/a	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a	n/a	n/a
4.4	light	+ 25 - 75	- 1	+ 20 - 80	+ 40 - 60	+ 14.28 - 85.72

5.1	rounded	+ 50 - 50	+ 25 - 75	+ 40 - 60	+ 40 - 60	+ 42.9 - 57.1
5.2	feather	+ 25 - 75	+ 1	+ 50 - 50	+ 40 - 60	+ 71.4 - 28.6
Total	+	+ 4.5	+ 5.75	+ 5.3	+ 5.2	+ 5.86
	-	- 3.5	- 2.25	- 2.7	- 2.8	- 2.14
%	+	+ 56	+ 72	+ 66.25	+ 65	+ 73
	-	- 44	- 28	- 33.75	- 35	- 23
Score		+ 12	+ 44	+ 32.50	+ 30	+ 50

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 50 Mod. Perc. Shape Billet

(Hammerstone shape units coded lower)

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C01079 Edge Unit 1 - all scars, all faces

	Prehistoric C01079 Edge Unit 1	AB2-2(c) Min. Plat. Isol. Using P.F.	AB2-2 Min. Press. Rub with P.F.	AB10-1(b) Min. Rub Buffet Billet	AB10-1(a) Min. Rub Buffet Hammer	AB6-13(a) Min. Shear Shape P.F.
1.1	very minimal to minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 15 - 85	- 1	+ 33.3 - 66.7
2.2	light	- 1	- 1	+ 15 - 85	- 1	+ 16.7 - 83.3
2.3	heavy	- 1	+ 1	- 1	- 1	+ 66.7 - 33.3
2.4	straight with convex projections	- 1	+ 84 - 16	+ 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1		straight and rounded	+ 86 - 14	+ 1	- 1	+ 75 - 25	+ 50 - 50
5.2		step and feather	+ 1	+ 1	+ 1	+ 1	+ 50 - 50
Total	+		+ 3.86	+ 5.84	+ 3.30	+ 3.75	+ 4.17
	-		- 3.14	- 1.16	- 3.70	- 3.25	+ 4.17
%	+		+ 55	+ 83	+ 47	+ 54	+ 60
	-		- 45	- 17	- 53	- 46	- 40
Score			+ 10	+ 66	- 6	+ 8	+ 20

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 66 - Min. Press. Rub with P.F.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01079	Main Flake Scar # 09	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very substantial	(1)	1. See scar 06 for edge treatment
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 09, C01079

	Prehistoric C01079 Scar 09 *	AB7-10 Sub. Perc. Thin Billet	AB5-9(b) Mod. Perc. Thin Billet	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB11-11 Sub. Indirect Percussion
1.1	substantial	+ 1	+ 1	+ 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 75 - 25	+ 80 - 20	+ 1	+ 66.7 - 33.3
3.2	gradual	+ 75 - 25	+ 80 - 20	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 80 - 20	+ 80 - 20	+ 1
4.1	0	+ 50 - 50	+ 80 - 20	+ 20 - 80	+ 66.7 - 33.3
4.2	n/a	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a	n/a
4.4	light	+ 25 - 75	+ 20 - 80	+ 40 - 60	+ 33.3 - 66.7

5.1		rounded	+ 50 - 50	+ 40 - 60	+ 40 - 60	+ 33.3 - 66.7
5.2		feather	+ 25 - 75	+ 50 - 50	+ 40 - 60	+ 1
Total	+		+ 4.5	+ 5.3	+ 5.2	+ 6
	-		- 3.5	- 2.7	- 2.8	- 2
%	+		+ 56	+ 66.25	+ 65	+ 75
	-		- 44	- 33.75	- 35	- 25
Score			+ 12	+ 32.50	+ 30	+ 50

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 50 - Sub. Indirect Percussion

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01079	Main Flake Scar # 019	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very substantial	(1)	1. see scar 06 for edge treatment
2.1	Edge Sharpness			2. Some other scars that have ribs are the same as this one.
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	distinct		
3.2	Bulb to Scar Transition Angle	steep		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on distal 1/2		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded partly straight		
5.2	Scar Termination at Distal Edge	feather and step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 019, C01079

	Prehistoric C01079 Scar 019	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc. Billet
1.1	very substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	distinct	- 1	+ 25 - 75	+ 33.3 - 66.7
3.2	steep	- 1	+ 25 - 75	- 1
3.3	thin	+ 1	+ 50 - 50	+ 1
4.1	present	+ 1	+ 50 - 50	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	- 1	+ 1	+ 1
4.4	0	+ 60 - 40	+ 75 - 25	+ 66.7 - 33.3

5.1	rounded	+ 40 - 60	+ 50 - 50	+ 33.3 - 66.7
5.2	pred. step some feather	+ 1	+ 1	+ 20 - 80
Total	+	+ 6.0	+ 6.75	+ 5.87
	-	- 4.0	- 3.25	- 4.13
%	+	+ 60	+ 68	+ 59
	-	- 40	- 32	- 41
Score		+ 20	+ 36	+ 18

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 36 Sub. Perc. Thin Billet

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01079	Main Flake Scar # R7	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	(1)	1. See scar 06 for edge treatment.
2.1	Edge Sharpness			2. Not possible to assess whether they are far apart or close together.
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	evenly dist. (2)		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	feather step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R7, C01079

	Prehistoric C01079 Scar R7	AB7-10 Sub. Perc. Thin Billet	AB8-6 Sub. Press. Thin P.F.	AB11-11 Sub. Indirect Percussion	AB16-7(a) Sub./Mod. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 75 - 25	+ 1	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1	+ 1
4.3	evenly dist.	- 1	+ 1	+ 1	+ 1
4.4	0	+ 75 - 25	+ 75 - 25	+ 66.7 - 33.3	+ 60 - 40

5.1	straight	- 1	+ 25 - 75	- 1	+ 60 - 40
5.2	feather step	+ 1	+ 1	+ 50 - 50	+ 1
Total	+	+ 6.25	+ 8.5	+ 7.17	+ 8.8
	-	- 3.75	- 1.5	- 2.83	- 1.2
%	+	+ 63	+ 85	+ 72	+ 88
	-	- 37	- 15	- 28	- 12
Score		+ 26	+ 70	+ 44	+ 76

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 70 - Sub. Perc. Thin Pressure Flaker

This scar is either pressure flaking or hammerstone, two behavior units which are similar in morphology. Because there is other pressure work on the artifact (scar R18 and tip area), this scar has been identified as pressure.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01079	Main Flake Scar # R8	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very substantial	(1)	1. See scar 06 for edge treatment.
2.1	Edge Sharpness			2. Most of the bulb of force may be missing.
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct (2)		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on distal 1/2		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded and irregular		
5.2	Scar Termination at Distal Edge	step feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R8, C01079

	Prehistoric C01079 Scar R8	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Ind. Perc.
1.1	very sub.	+ 1	+ 1	+ 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 1	+ 80 - 20	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 80 - 20	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 80 - 20	+ 50 - 50	+ 1
4.1	present	+ 80 - 20	+ 20 - 80	+ 50 - 50	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1	+ 1
4.3	far apart on distal 1/2	- 1	+ 1	+ 1	+ 1
4.4	light	+ 40 - 60	+ 20 - 80	+ 25 - 75	+ 33.3 - 66.7

5.1	rounded and irregular	+ 40 - 60	+ 40 - 60	+ 1	+ 50 - 50
5.2	step feather	+ 1	+ 1	+ 1	+ 50 - 50
Total	+	+ 7.4	+ 7.2	+ 7.75	+ 7.32
	-	- 2.6	- 2.8	- 2.25	- 2.68
%	+	+ 74	+ 72	+ 78	+ 73
	-	- 26	- 28	- 22	- 27
Score		+ 48	+ 44	+ 56	+ 46

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 56 Sub. Perc. Thin Billet

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01079	Main Flake Scar # R18	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. See scar 06 for edge treatment.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. close together & evenly dist.		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R18, C01079

	Prehistoric C01079 R17	AB9-5 Mod. Perc. Thin Billet	AB15-18(a) Mod. Perc. Shape Billet	AB8-6 Sub. Press. Thin with P.F.	AB16-17(a) Mod./Sub. Perc. Thin Hammerstone	AB3-17 Mod. Perc. Shape Hammer.
1.1	moderate	+ 1	+ 1	+ 1	+ 1	+ 1
2.1						
2.2						
2.3						
2.4						
3.1	indistinct	+ 80 - 20	+ 85.72 - 14.28	+ 1	+ 1	+ 1
3.2	gradual	+ 80 - 20	+ 1	+ 1	+ 1	+ 1
3.3	thin	+ 80 - 20	+ 85.72 - 14.28	+ 1	+ 80 - 20	+ 1
4.1	present	+ 20 - 80	+ 14.28 - 85.72	+ 50 - 50	+ 80 - 20	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
4.3	rel. close together & evenly dist.	- 1	- 1	+ 1	- 1	- 1
4.4	light	+ 20 - 80	+ 14.28 - 85.72	+ 25 - 75	+ 40 - 60	+ 33.3 - 66.7

5.1	straight	+ 60 - 40	+ 57.1 - 42.9	+ 25 - 75	+ 60 - 40	+ 1
5.2	feather	+ 25 - 75	+ 71.4 - 28.6	+ 75 - 25	+ 40 - 60	+ 1
Total	+	+ 5.65	+ 6.26	+ 8.25	+ 7.0	+ 7.67
	-	- 4.35	- 3.74	- 1.75	- 3.0	- 2.33
%	+	+ 57	+ 63	+ 83	+ 70	+ 77
	-	- 43	- 37	- 17	- 30	- 23
Score		+ 14	+ 26	+ 66	+ 40	+ 54

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 66 - Sub. Pressure Thin with P.F.

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact C01079

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
06		possible	+ 50	Mod. Perc. Shape Billet	AB15-18(a)
	Edge Unit # 1	possible	+ 66	Min. Pressure Rub with P.F. (no other scores in poss, range)	
09		possible	+ 50	Sub. Indirect Percussion	AB11-11
019		possible	+ 36	Sub. Perc. Thin Billet	AB7-10
R7		highly probable	+ 70	Sub. Pressure Thin with P.F.	AB8-6
R8		possible	+ 56	Sub. Perc. Thin Billet	AB7-10
R17		possible	+ 66	Sub. Pressure thin with P.F.	AB8-6
top & base		n/a	n/a	Minimum pressure shape with P.F.	AB13-15

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units: C01079

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Substantial Indirect Percussion Thinning: Identified on scar 09, this behavior unit is used to remove very large, thin, face paring flakes used to thin the specimen. Production Unit Code is 40:5, 51, 51. Indirect percussion involves placing the edge of a billet on a platform and then hitting it with another billet (billet on billet).

(b) Moderate/Substantial Percussion Thin with Billet: Identified on scars 019 and R8, this unit was used for the majority of face paring or thinning flakes on the artifact. Production Unit Code is 40:4, 41, 51.

(c) Moderate Percussion Shape with Billet: This was the method used to move in the margins and shape the artifact after thining. Production Unit 33:3, 42, 51.

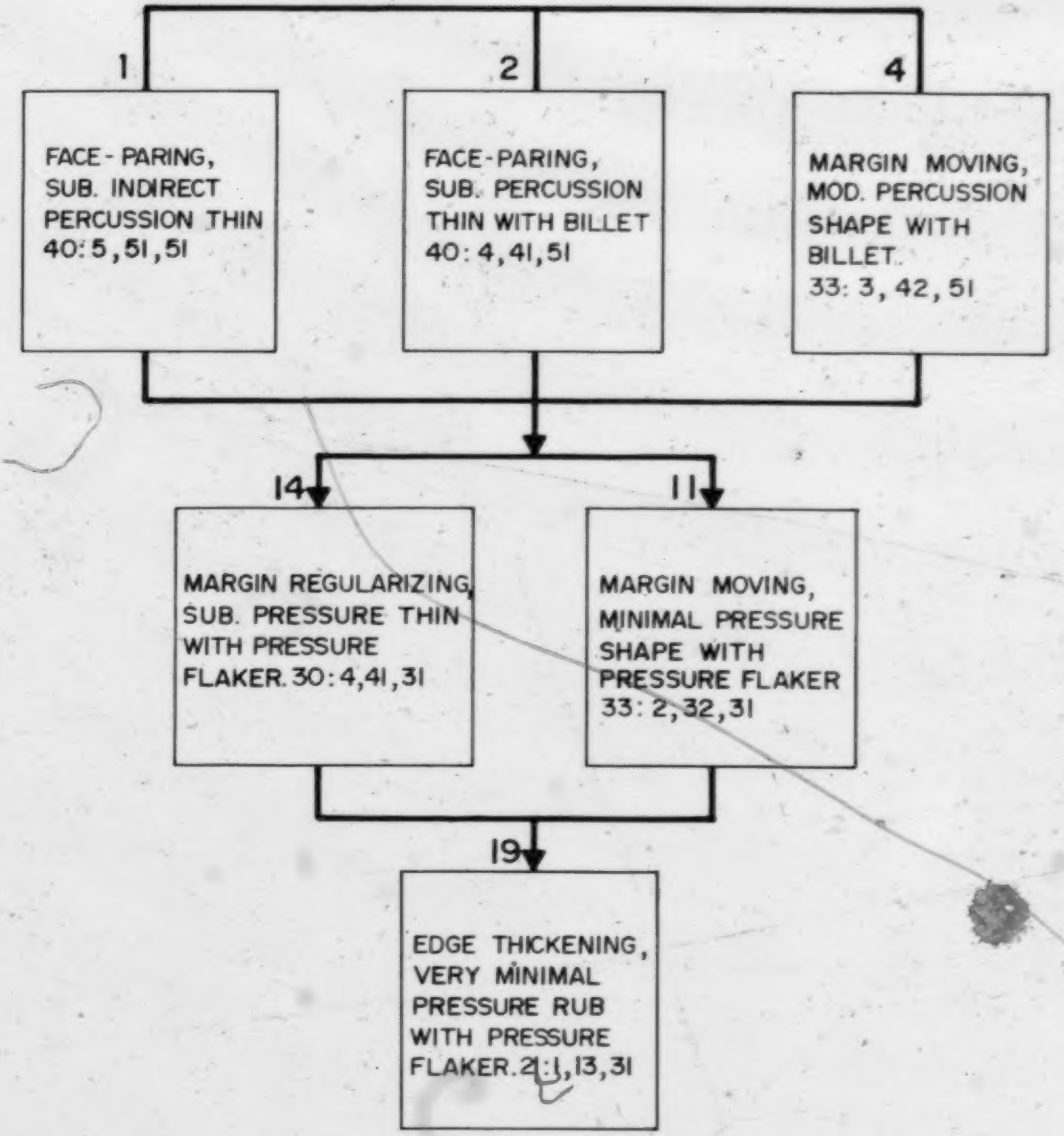
3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

(a) Substantial Pressure Thin with P.F.: Identified from scars R7 and R17, it was used to remove interflake scar ridges and at the same time, face paring and thinning. Scar R18 is a good example. Production Unit Code is 30:4, 41, 31.

(b) Min./Mod. pressure Shape with P.F.: These units are present on the tip and especially the base of the artifact and was used to shape the base and create a bifacial edge angle. Production Code is 31/33:2/3, 32, 31.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

(a) Only one edge unit (# 1) is identified on this specimen comprising a minimum pressure rub with the tip of a pressure flaker. This behavior unit executed by rubbing across the artifact edge with the tip of a pressure flaker serves to remove on overly thin edge, thereby thickenin and also straightening it. A relatively small amount of material, in the form of very minimal flakes, was removed and the unit leaves distinct convex projections (04%) and some U-shaped notches from the pressure work (16%). See reference experiment AB2-2(b) for details. Production Unit Code is 21:1, 13, 31.


1
FACE-PARING, SUB. INDIRECT PERCUSSION THIN 40: 5, 51, 51
2
FACE-PARING, SUB. PERCUSSION THIN WITH BILLET 40: 4, 41, 51
4
MARGIN MOVING, MOD. PERCUSSION SHAPE WITH BILLET. 33: 3, 42, 51
14
MARGIN REGULARIZING, SUB. PRESSURE THIN WITH PRESSURE FLAKER. 30: 4, 41, 31
11
MARGIN MOVING, MINIMAL PRESSURE SHAPE WITH PRESSURE FLAKER 33: 2, 32, 31
19
EDGE THICKENING, VERY MINIMAL PRESSURE RUB WITH PRESSURE FLAKER. 21: 1, 13, 31

(b) Reconstructing Sequencing of Production Units: C01079

3.4 Flow Diagram of Production Units (above)

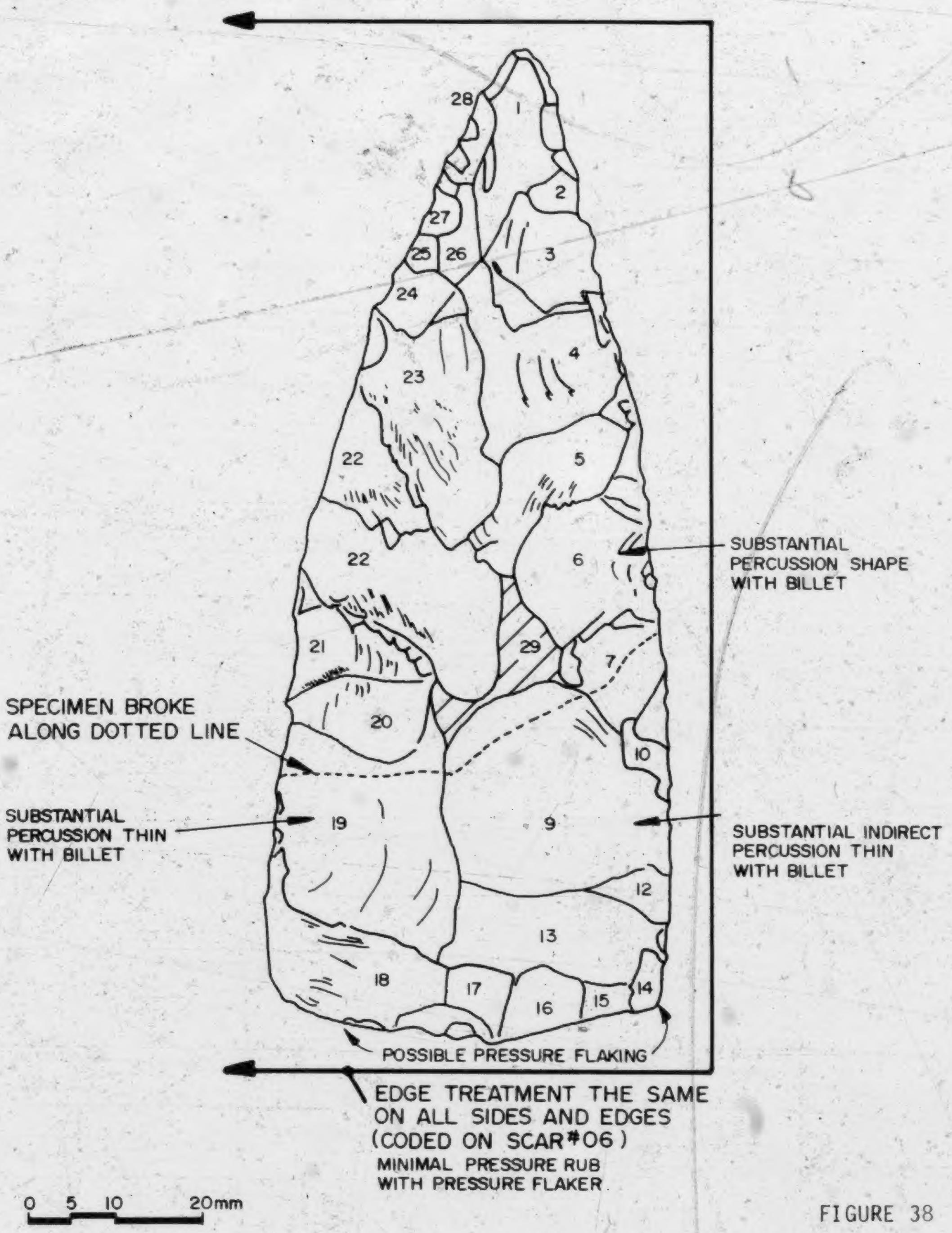
3.5 Description and Discussion of Technological Grammar Found on Artifact

Prehistoric artifact C01079 is a well made symetrical biface in a finished form. Not surprisingly, there is little evidence left of the original shaping flakes, these having been obscured by the extensive thinning found in the finishing stages. Some of the large flakes (i.e., 09) may have been removed by substantial indirect percussion thinning but the majority of the work on the specimen (4 scars identified: 019, R-7, 8, 17) was by substantial billet face paring (or thinning) percussion flakes. Following the percussion thinning which leaves sharp, thin edges and shallow curved notches on the edges, some percussion shaping or margin moving was undertaken to shape the outline form of the artifact. This was followed by pressure margin regularizing to remove interscar flake ridges. As well, pressure shape was used to shape the tip and base.

Following the pressure flaking and billet shaping, a pressure flaker was used to strengthen the overly thin edge and, to some extent, straighten the edge by levelling out the flat curved notches. However, while this does straighten the edge it also leaves a rough edge with many small convex projections and the occasional U-shaped notch. For some reason which is not readily apparent from a technological aspect (which may suggest post-manufacturing breakage), the artifact is broken bi-laterally and has been restored for analysis.

DeHa -8 — CO 1079

OBVERSE FACE



SPECIMEN BROKE ALONG DOTTED LINE

SUBSTANTIAL PERCUSSION SHAPE WITH BILLET

SUBSTANTIAL PERCUSSION THIN WITH BILLET

SUBSTANTIAL INDIRECT PERCUSSION THIN WITH BILLET

POSSIBLE PRESSURE FLAKING

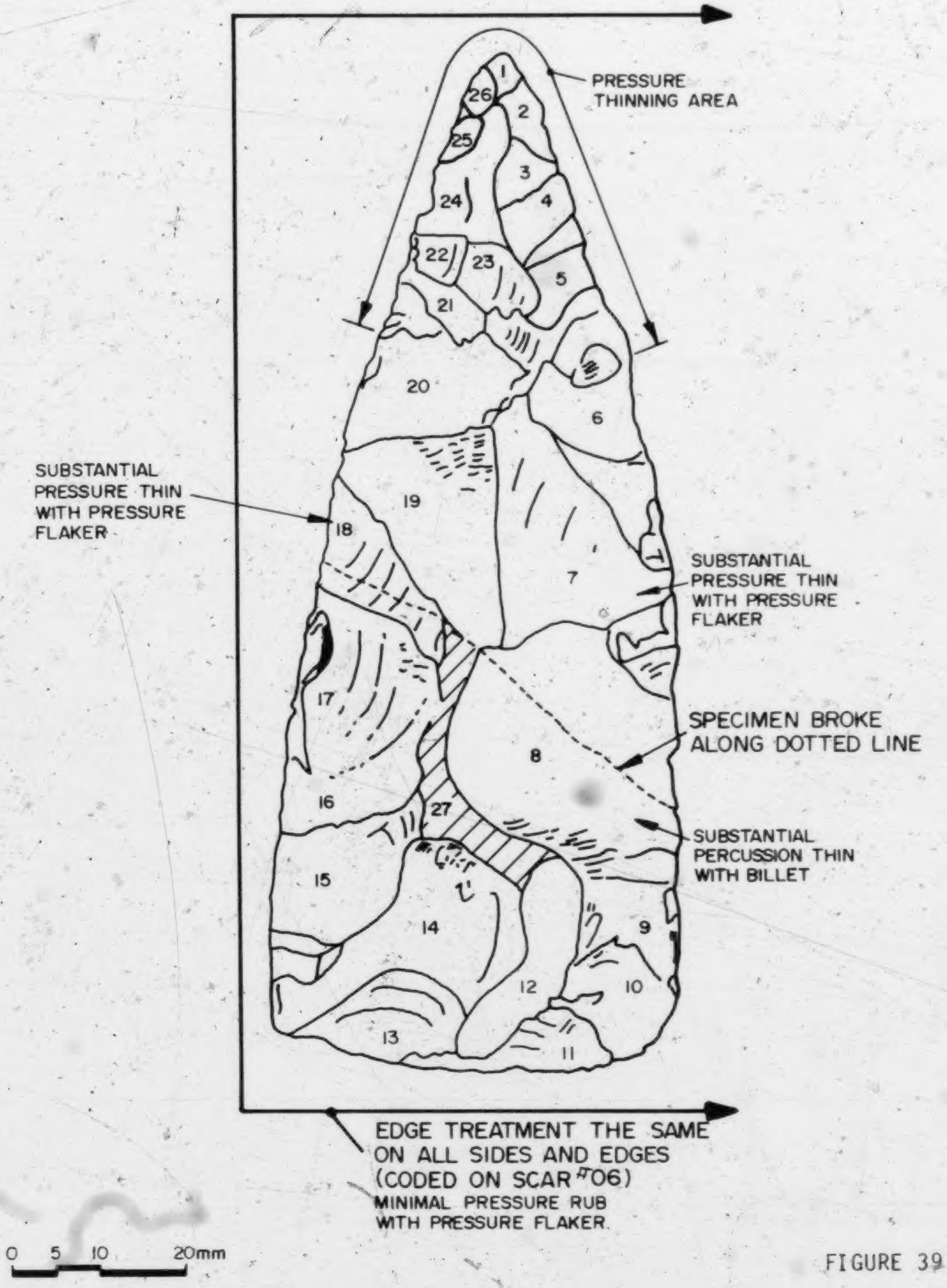
EDGE TREATMENT THE SAME ON ALL SIDES AND EDGES (CODED ON SCAR #06)
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER

1
2
3
4
5
6
7
9
10
12
13
14
15
16
17
18
19
20
21
22
22
23
24
25
26
27
28
29
0 5 10 20mm

FIGURE 38

DeHa-8 — CO 1079

REVERSE FACE


PRESSURE THINNING AREA
SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
SPECIMEN BROKE ALONG DOTTED LINE
SUBSTANTIAL PERCUSSION THIN WITH BILLET
EDGE TREATMENT THE SAME ON ALL SIDES AND EDGES (CODED ON SCAR #06) MINIMAL PRESSURE RUB WITH PRESSURE FLAKER.
1
2
3
4
5
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7
8
9
10
11
12
13
14
15
16
17
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19
20
21
22
23
24
25
26
27
0 5 10 20mm

FIGURE 39

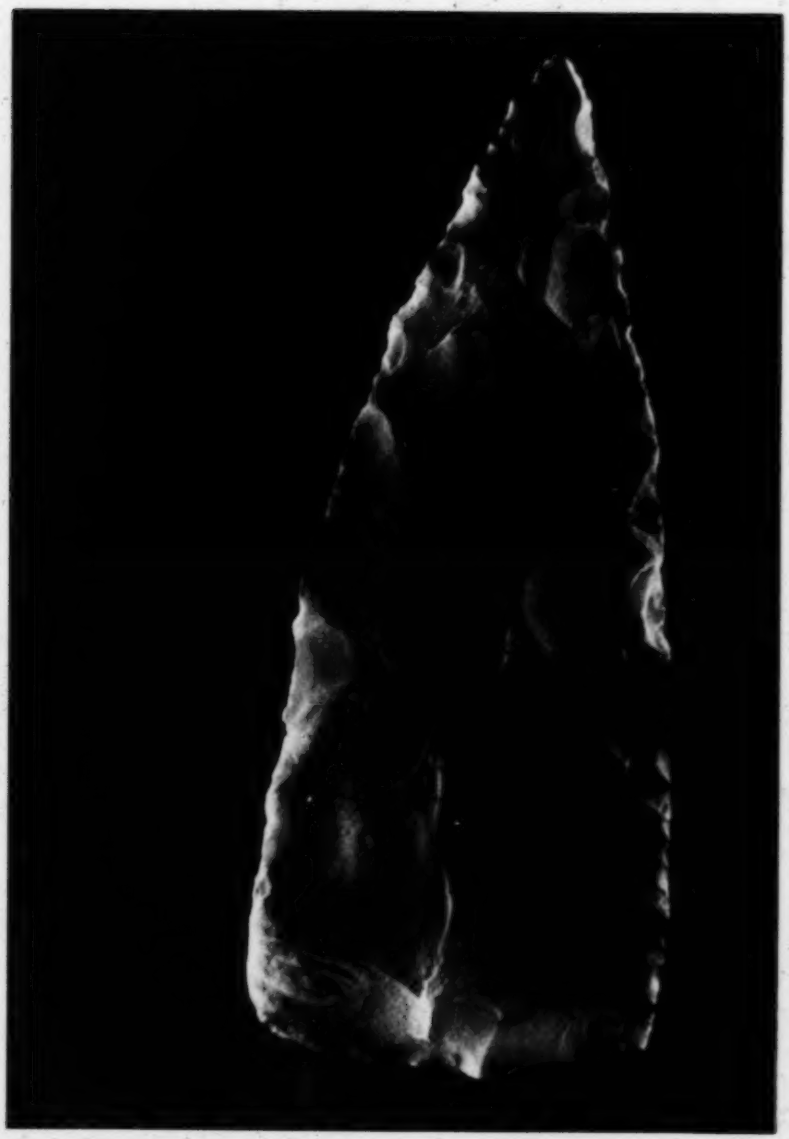


Plate 48: Prehistoric Artifact C01079, Obverse Face.

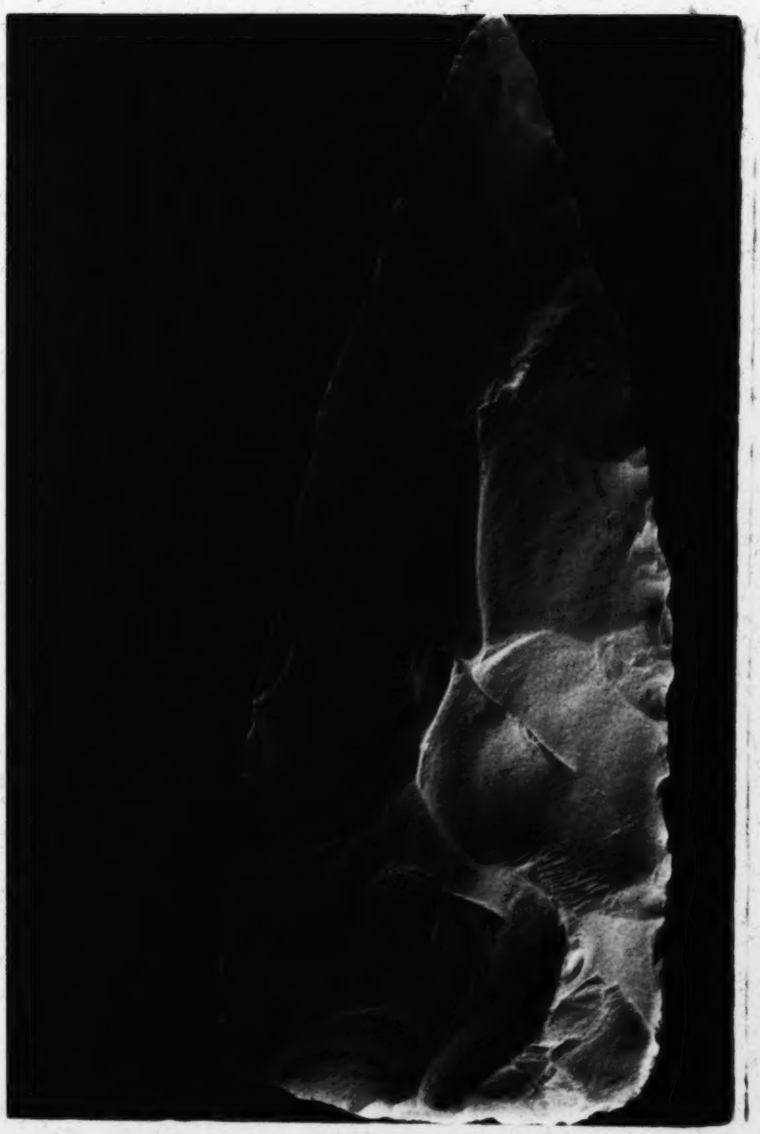


Plate 49: Prehistoric Artifact C01079, Reverse Face.

Table 62: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: DeHa-8, Jordan Site

1.3 Specimen Catalogue #: C01067

1.4 Photographic Plate Identification: Roll 1, A2, #37
Roll 1, A1, #31

1.5 Standard Artifact Description:

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: biface

1.8 Flaking (Bifacial/Unifacial): bifacial

1.9 Metric Size:
length - 10.8 cm
width - 6.6 cm
thickness - 1.2 cm

1.10 Form/Morphology Description:

This semi-lunate biface has extensive primary percussion flaking on its obverse and reverse surfaces with less retouching on the obverse face. One lateral margin has a steep working face which may have served as a scraping/cutting edge. Distinctive thinning flakes are also visible on the broad straight base of the specimen.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01067	Main Flake Scar # 08	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very substantial	very minimal to minimal (1)	1. Edge Unit 1 Scars 1 to 14 obverse face, scars 12-37 Reverse face (see scar R-14 and R-18).
2.1	Edge Sharpness		intermediate to sharp	
2.2	Margin Damage		light	
2.3	Microflakes		heavy	2. Impossible to code due to natural undulations in raw material.
2.4	Proximal Edge Morphology		straight	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0 (2)		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	irregular	straight/ irregular	
5.2	Scar Termination at Distal Edge	feather	feather and step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 08, C01067

	Prehistoric C01067 Scar 08	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion
1.1	very substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1
4.1	0	+ 20 - 80	+ 50 - 50	+ 66.7 - 33.3
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 60 - 40	+ 75 - 25	+ 66.7 - 33.3

5.1	irregular	- 1	+ 50 - 50	+ 66.7 - 33.3
5.2	feather	+ 1	+ 1	+ 1
Total	+	+ 5.6	+ 5.75	+ 6.67
	-	- 2.4	- 2.25	- 1.33
%	+	+ 70	+ 72	+ 83
	-	- 30	- 28	- 17
Score		+ 40	+ 44	+ 66

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 60 Sub Indirect Percussion

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C01067, Edge Unit 1 (coded on Scar 08)

•	Prehistoric C01067 Edge Unit 1	AB2-2(b) Min. Press. Rub/P.F.	AB6-13(a) Min. Shear Shape P.F.	AB6-13(b) Mod./Sub. Shear Shape P.F.	AB10-1(b) Min. Rub Buffet Billet	AB10-1(a) Min. Rub Buffet Hammerstone
1.1	very minimal to minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate to sharp	+ 50 - 50	+ 1	- 1	+ 50 - 50	+ 1
2.2	light	- 1	+ 16.7 - 83.3	- 1	+ 15 - 85	- 1
2.3	heavy	+ 1	+ 66.7 - 33.3	+ 1	- 1	+ 1
2.4	straight	+ 84 - 16	+ 1	+ 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight/ irregular	+ 50 - 50	+ 1	+ 1	+ 20 - 80	+ 75 - 25
5.2	feather/ step	+ 1	+ 80 - 20	+ 1	+ 1	+ 1
Total	+	+ 4.84	+ 5.64	+ 5	+ 3.85	+ 5.75
	-	- 2.16	- 1.36	- 2	- 3.15	- 1.25
%	+	+ 69	+ 81	+ 71	+ 55	+ 82
	-	- 31	- 19	- 29	- 45	- 18
Score		+ 38	+ 62	+ 42	+ 10	+ 64

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 64 Min. Rub/Buffet Hammerstone

Possible + 62 Min. Shear Shape P.F.

N.B. After examining the two experimental specimens [AB10-1, AB6-13(a)] representing the above morpho-units, it appears possible that both are represented. Shearing is especially identifiable on scars R17 to R19 and the portion of scar #01 adjacent to scars 03 to 08.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01067	Main Flake Scar # 09	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	(1)	1. Edge Unit 1 (see scar 09 coding and details).
2.1	Edge Sharpness			
2.2	Margin Damage			2. Coding difficult due to undulations in raw material
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present (2)		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on distal 1/2		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 09, C01067

	Prehistoric C01067 Scar 09	AB7-10 Sub. Perc. Thin Billet	AB-11 Sub. Indirect Percussion	AB16-7 Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	+ 1	+ 1	- 1
4.4	light	+ 25 - 75	+ 33.3 - 66.7	+ 40 - 60

5.1	irregular	+ 50 - 50	+ 66.7 - 33.3	- 1
5.2	feather	+ 25 - 75	+ 1	+ 40 - 60
Total	+	+ 6.5	+ 8	+ 6.4
	-	- 3.5	- 2	- 3.6
%	+	+ 65	+ 80	+ 64
	-	- 35	- 20	- 36
Score		+ 30	+ 60	+ 28

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 60 Sub. Indirect Percussion

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01067	Main Flake Scar # 016	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very substantial	minimal (1)	1. Edge Unit 2 This unit is primarily on the reverse face with the obverse face being used as a platform area. Scars 15-25 obverse face, composite scar area R1 on reverse face (see coding of scar R1).
2.1	Edge Sharpness		intermediate	
2.2	Margin Damage		heavy	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		straight	
3.1	Negative Bulb of Force	indistinct		2. This edge is very complex and difficult to code as scar definitions are poor and overlap a great deal.
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0 (3)		3. There appear to be natural ridges in the raw material making it difficult to define the nature of any ribs present.
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular	straight/ (2) rounded	
5.2	Scar Termination at Distal Edge	pred. feather	feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 016* C01067

	Prehistoric C01067 Scar 016	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion
1.1	very substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1
4.1	0	+ 20 - 80	+ 50 - 50	+ 66.7 - 33.3
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	light	+ 40 - 60	+ 25 - 75	+ 33.3 - 66.7

5.1	irregular	- 1	+ 50 - 50	+ 66.7 - 33.3
5.2	pred. feather	+ 1	+ 1	+ 1
Total	+	+ 5.4	+ 5.25	+ 6
	-	- 2.6	- 2.75	- 2
%	+	+ 68	+ 66	+ 75
	-	- 32	- 34	- 25
Score		+ 36	+ 32	+ 50

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 50 - Sub. Indirect Percussion

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar C01067 Edge Unit #2 (Coded on Scar 016)

	Prehistoric C01067 Edge Unit #2	AB14-16(b) Min. Perc. Shape Hammerstone	AB15-18(b) Min. Perc. Shape Billet	AB6-13(b) Mod./Sub. Shear Shape P.F.	AB10-1(a) Min. Rub Buffet Hammerstone	AB2-2(b) Min. Press. Rub with P.F.
1.1	very min.	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate to sharp	+ 83.3 - 16.7	+ 50 - 50	+ 50 - 50	+ 1	+ 50 - 50
2.2	heavy	+ 1	+ 1	+ 1	+ 1	+ 1
2.3	heavy	- 1	+ 80 - 20	+ 1	- 1	+ 1
2.4	straight (convex project)	+ 83.3 - 16.6	+ 1	+ 1	+ 1	+ 84 - 16
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight/ rounded	+ 1	+ 1	+ 44 - 56	+ 75 - 25	+ 1
5.2	feather	+ 66.7 - 33.3	+ 80 - 20	+ 77.7 - 22.3	+ 50 - 50	+ 50 - 50
Total	+	+ 5.3	+ 6.1	+ 5.7	+ 5.25	+ 4.84
	-	- 1.7	- .9	- 1.3	- 1.75	- 2.16
%	+	+ 76	+ 87	+ 81	+ 75	+ 69
	-	- 24	- 13	- 19	- 25	- 31
Score		+ 52	+ 74	+ 62	+ 50	+ 28

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 74 - Min. Perc. Shape Billet, followed by
Possible + 62 - Mod./Sub. Shear Shape P.F.

N.B. Shear shaping is also present on the other side of the artifact on edge unit # 1.

25

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01067	Main Flake Scar # 021	Edge Treatment on Same Scar	Notes
1.1	Scar Size	sub.	(1)	1. Edge Unit 2 (see scar 016 for details).
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 021* C01067

	Prehistoric C01067 Scar 021
1.1	substantial
2.1	
2.2	
2.3	
2.4	
3.1	indistinct
3.2	gradual
3.3	thin
4.1	0
4.2	n/a
4.3	n/a
4.4	light

5.1	rounded
5.2	feather
Total +	
-	

* Same morphology as scar 06 on specimen C01079 - use this sheet for identification.

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 50 - Sub. Indirect Percussion AB11-11

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01067	Main Flake Scar # R1	Edge Treatment on Same Scar	Notes
1.1	Scar Size	n/a see not (1)	minimal (1)	1. Scar # R1 is a composite area of many small scars forming an extensive edge treatment unit which is designated Edge Unit #2. On the obverse face this covered scars 15 to 25 (see scars 016, 025).
2.1	Edge Sharpness		intermediate (2)	
2.2	Margin Damage		heavy	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		straight	
3.1	Negative Bulb of Force			2. The unit is unifacial on the reverse face only. There is only some light edge damage on the obverse face, no microflakes or notable flake scars.
3.2	Bulb to Scar Transition Angle			
3.3	Flake Thickness			
4.1	Presence or Absence of Ribs			
4.2	Distinctiveness of Ribs			3. There is also a subsequent unit applied to the edge (see coding for scar 016).
4.3	Rib Spacing And Distribution			
4.4	Tearing			
5.1	Scar Shape at Distal Edge		straight/ rounded	
5.2	Scar Termination at Distal Edge		feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R1 - C01067 (Composite Scar Unit)*

	Prehistoric C01067 Scar Unit R1	AB14-16(b) Min. Perc. Shape Hammerstone	AB15-18(b) Min. Perc. Shape Billet	AB10-1(a) Min. Rub/Buffet Hammerstone	AB13-15 Min. Press. Shape with P.F.	AB6-13(a) Mod./Sub. Shear Shape P.F.
1.1	mostly min. some mod.	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate	+ 83.3 - 16.7	- 1	+ 1	- 1	- 1
2.2	heavy	+ 1	+ 1	+ 1	- 1	+ 1
2.3	heavy	- 1	+ 80 - 20	- 1	- 1	+ 1
2.4	straight	+ 83.3 - 16.6	+ 1	+ 1	- 1	
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight/ rounded	+ 1	+ 1	+ 75 - 25	+ 1	+ 44 - 56
5.2	feather	+ 66.7 - 33.3	+ 80 - 20	+ 50 - 50	+ 88 - 12	+ 77.7 - 22.3
Total	+	+ 5.3	+ 5.6	+ 5.25	+ 2.88	+ 5.2
	-	- 1.7	- 1.4	- 1.75	- 4.12	- 1.8
%	+	+ 76	+ 80	+ 75	+ 41.14	+ 14
	-	- 24	- 20	- 25	- 58.86	- 26
Score		+ 52	+ 60	+ 50	- 17.72	+ 48

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

* Possible + 60 - Min. Perc. Shape Billet

N.B.

The above confirms the coding on scar 016 indicating minimum percussion shape with billet followed by shear shaping.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01067	Main Flake Scar # R14	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very substantial	(1)	1. Edge Unit 1 - this unit covers scars 12 - 37 on the reverse face and scars 1-14 obverse face. (See scars 08, 09).
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thick (2.0 cm)		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	far apart and evenly dist.		
4.4	Tearing			
5.1	Scar Shape at Distal Edge			
5.2	Scar Termination at Distal Edge			

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R14, C01067

	Prehistoric C01067 Scar R14	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion
1.1	very substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.3	thick	+ 20 - 80	+ 50 - 50	- 1
4.1	present	+ 80 - 20	+ 50 - 50	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1
4.3	far apart on distal 1/2	- 1	+ 1	+ 1
4.4	light	+ 40 - 60	+ 50 - 50	+ 33.3 - 66.7

5.1	rounded	+ 40 - 60	+ 50 - 50	+ 33.3 - 66.7
5.2	feather	+ 40 - 60	+ 25 - 75	+ 1
Total	+	+ 6.2	+ 6.75	+ 6.33
	-	- 3.8	- 3.25	- 3.67
%	+	+ 63	+ 68	+ 63
	-	- 38	- 32	- 37
Score		+ 25	+ 36	+ 26

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Indeterminate + 26 - Sub. Indirect Percussion Thin (Billet on Billet)

Because of its thickness the scar coded out as billet. All other morphology, especially the striking platform size, indicates it may be indirect percussion and this is the identification used.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01067	Main Flake Scar # R25	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. Edge Unit 1 (see scar R14 for coding and details.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R25 C01067

	Prehistoric C01067 Scar R25	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet	AB8-6 Sub. Press. Thin with P.F.
1.1	moderate	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 80 - 20	+ 1
3.2	gradual	+ 1	+ 80 - 20	+ 1
3.3	thin	+ 80 - 20	+ 80 - 20	+ 1
4.1	present	+ 80 - 20	+ 20 - 80	+ 50 - 50
4.2	indistinct	+ 1	+ 1	+ 1
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 60 - 40	+ 40 - 60	+ 75 - 25

5.1	rounded	+ 50 - 50	+ 40 - 60	+ 75 - 25
5.2	feather	+ 83.4 - 16.6	+ 50 - 50	+ 75 - 25
Total	+	+ 7.5	+ 5.9	+ 7.75
	-	- 1.5	- 3.1	- 1.25
%	+	+ 83	+ 66	+ 86
	-	- 17	- 34	- 14
Score		+ 66	+ 32	+ 72

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 72 - Sub. Perc. Thin with P.F.

N.B. Adjacent scars are also pressure flaking (see R26).

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01087	Main Flake Scar # R26	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate		
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. close together & evenly dist.		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R26 C01087

	Prehistoric C01087 Scar R26	AB8-6 Sub. Press. Thin with P.F.	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet
1.1	moderate	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 1	+ 80 - 20
3.2	gradual	+ 1	+ 1	+ 80 - 20
3.3	thin	+ 1	+ 80 - 20	+ 80 - 20
4.1	present	+ 50 - 50	+ 80 - 20	+ 20 - 80
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. close together & evenly dist.	+ 1	- 1	- 1
4.4	0	+ 1	+ 60 - 40	+ 40 - 60

5.1	rounded	+ 1	+ 50 - 50	+ 40 - 60
5.2	feather	+ 1	+ 83.4 - 16.6	+ 50 - 50
Total	+	+ 9.5	+ 7.5	+ 5.9
	-	- .5	- 2.5	- 4.1
%	+	+ 95	+ 75	+ 59
	-	- 5	- 25	- 41
Score		+ 90	+ 50	+ 18

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 90 Sub. Pressure Thin with P.F.

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
08		possible	+ 60	Sub. Indirect Percussion thin	AB11-1
	Edge Unit # 1	possible	+ 64	Min. rub/buffet hammerstone followed by shear shape with P.F. (see edge unit 2)	AB10-1(a)
09		possible	+ 60	Sub. Indirect Percussion thin	AB11-11
016		possible	+ 50	Sub. Indirect Percussion thin	AB11-11
	Edge Unit # 2	possible	+ 62	Mod./Sub shear shape with P.F. (preceded by min. perc. shape billet)	AB6-13(b)
021		possible	+ 50	Sub. Indirect Percussion thin	AB11-11
R1 Composite scar		possible	+ 60	Min. Perc. Shape Billet (followed by mod./sub. shear shape with P.F.)	AB15-18(b)
R14		indeterminate	+ 26	Sub. indirect percussion thin	AB11-11
R25		Highly Probable	+ 72	sub. press. thin with p.f.	AB8-6
R26		Highly Probable	+ 90	sub. pressure thin with p.f.	AB8-6

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units: C01067

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Very substantial Indirect Percussion Thinning: This is the most substantial unit on the specimen and was used as the major thinning or face paring behavior. Indirect percussion removes very large thin spatulate (or wide) flakes that usually have rounded or irregular distal edge shapes with a feather termination. Production Unit Code is 40:5, 51, 51. Indirect percussion scars are 08, 09, 016, and 021.

(b) Minimum Percussion Shape with Billet: Identified from scar # R1 (composite scar). This is a unifacial application of margin contouring to create a steep scraping face along the right lateral margin of the reverse face of the artifact. The purpose was to create a substantial edge angle or a very strong working face. Production Unit Code is 31:2, 42, 51.

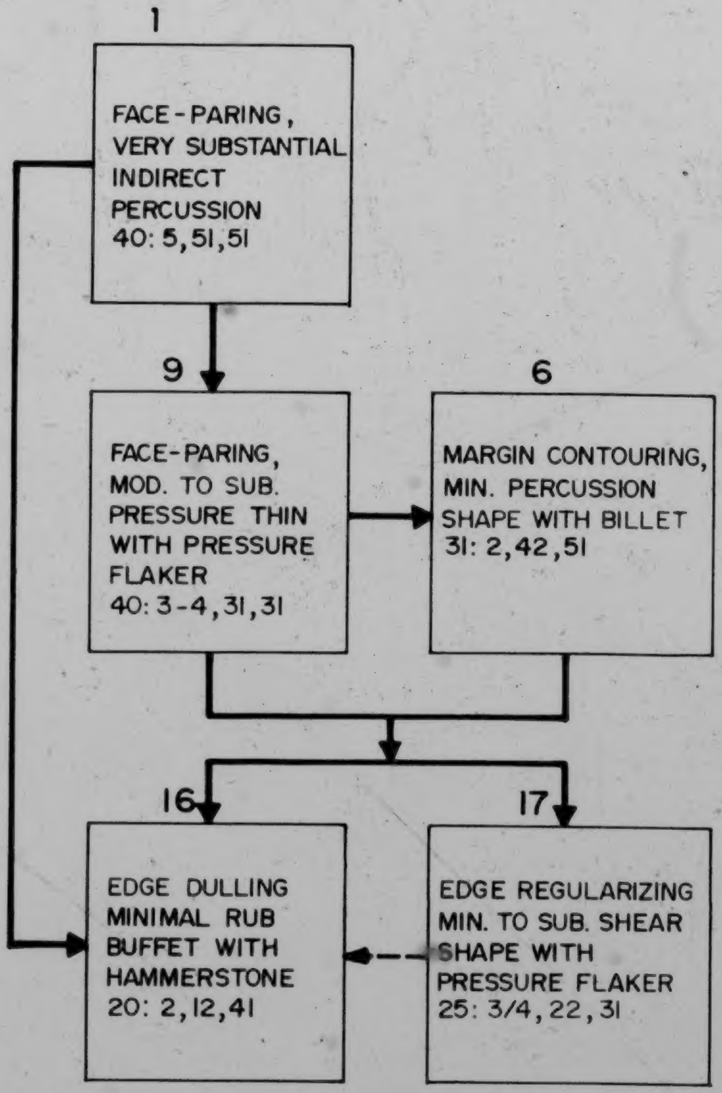
3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

(a) Mod./Substantial Pressure Thinning with Pressure Flaker: This unit is extensive on the specimen especially near the tip on the reverse side where there is a complex of pressure flakes (see scar forms for R25, R26). In fact, there appears to be overlapping pressure scars as scar R26 overlaps earlier pressure scars R27, 28, 29. This behavior unit served a secondary thinning or face paring function. Production Unit Code is 40:3/4, 31, 31.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

(a) Minimal Rub/Buffet with Hammerstone: A rub buffet involves rubbing the edge of the artifact while at the same time dragging the tool with minimal force. This removes minimal flakes and blunts or rounds the edge so it will not crush easily. It also serves to smooth the edge somewhat (see edge unit 1 on artifact). Production Unit Code is 20:2, 12, 41.

(b) Mod./Sub Shear Shape with Pressure Flaker: This was the final edge unit applied and served to straighten, center, and regularize the edge. Production Unit Code is 23-25:3-4, 22, 31. This unit is present on the obverse side scars O-3 to O-7 and on the reverse side on scar # 1 in front of 03 to 08.


1
FACE-PARING,
VERY SUBSTANTIAL
INDIRECT
PERCUSSION
40: 5,51,51
9
FACE-PARING,
MOD. TO SUB.
PRESSURE THIN
WITH PRESSURE
FLAKER
40: 3-4,31,31
6
MARGIN CONTOURING,
MIN. PERCUSSION
SHAPE WITH BILLET
31: 2,42,51
16
EDGE DULLING
MINIMAL RUB
BUFFET WITH
HAMMERSTONE
20: 2,12,41
17
EDGE REGULARIZING
MIN. TO SUB. SHEAR
SHAPE WITH
PRESSURE FLAKER
25: 3/4,22,31

(b) Reconstructing Sequencing of Production Units: C01067

3.4 Flow Diagram of Production Units (above)

3.5 Description and Discussion of Technological Grammar Found on Artifact

This prehistoric specimen has a distinctive semi-lunate outline shape quite different from the other Jordan site bifaces. However, the manufacturing units (behavior units) are essentially the same as other specimens in the collection. The major thinning unit is a very substantial indirect percussion thin which was used for face paring (thinning of the specimen). Following this one edge (Edge Unit 2) received special attention (right lateral margin, reverse face) in that billet percussion shape was used to contour the margins to create a steep angled and strong cutting/scraping edge. Some areas (especially near the curvature zone) were edge straightened, centered and regularized by means of a mod./sub shear shape with a pressure flaker. Some other edges on the artifact, especially near the tip, were thinned by means of moderate/substantial pressure flaking with a pressure flaker (see scars R25, R26). The pressure flaking is particularly prevalent on the tip of the specimen (reverse side scars R20 to R37) and in places, some overlapping is evident (scar R25 overlaps earlier pressure scars R27-29). Edge unit # 1 was applied to most of the pressure thinned areas and has been identified as a possible minimal rub/buffet with hammerstone. The rub/buffet activity involves rubbing the edge of the specimen in a dragging motion, thus blunting or rounding the edge and generally making it stronger and more serviceable (i.e., edge will not crush so easily when used). As in edge unit 2, some portions of this edge were also further treated with a mod./sub shear shape with pressure flaker (see scars R3-R8).

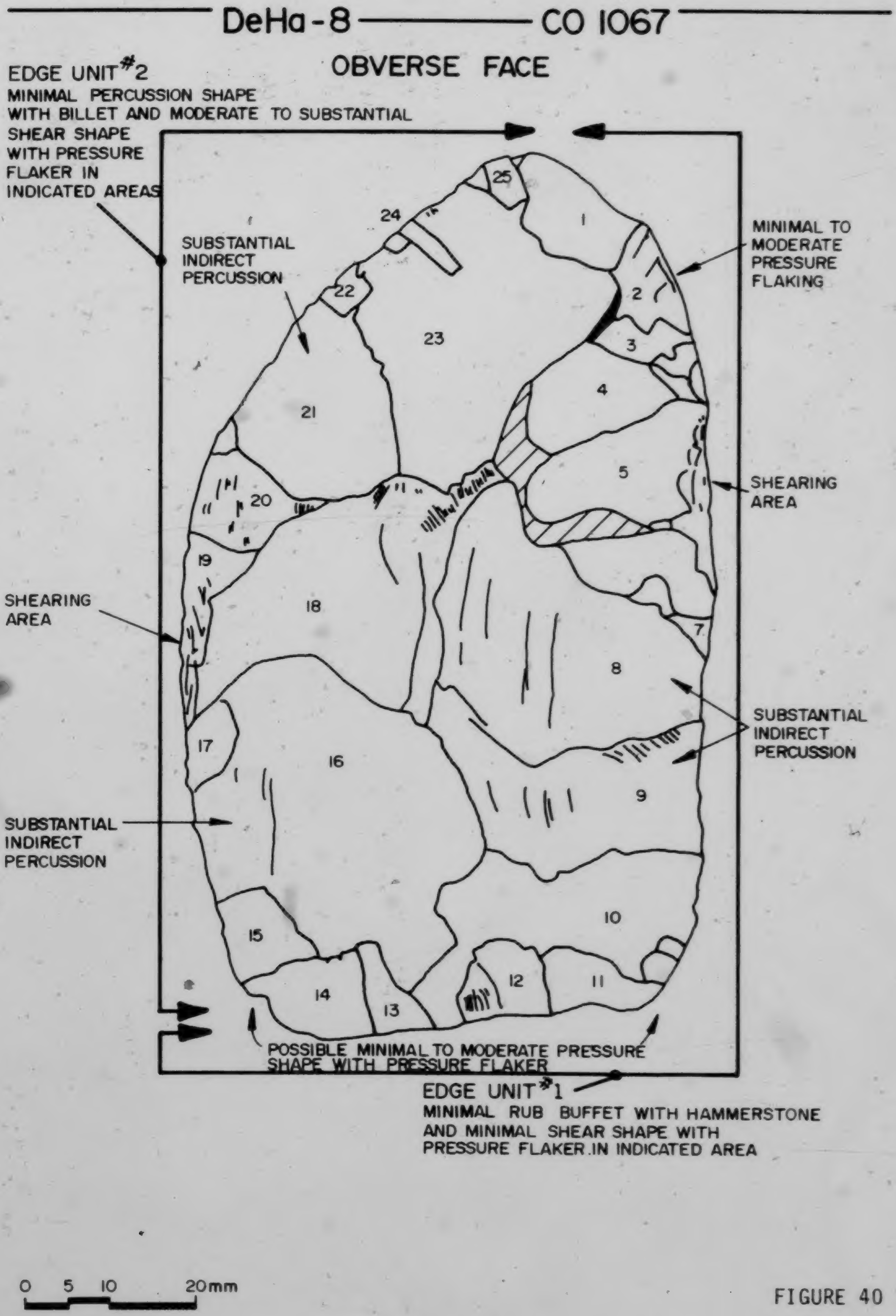

DeHa-8 — CO 1067
OBVERSE FACE
EDGE UNIT #2
MINIMAL PERCUSSION SHAPE WITH BILLET AND MODERATE TO SUBSTANTIAL SHEAR SHAPE WITH PRESSURE FLAKER IN INDICATED AREAS
SUBSTANTIAL INDIRECT PERCUSSION
MINIMAL TO MODERATE PRESSURE FLAKING
SHEARING AREA
SHEARING AREA
SUBSTANTIAL INDIRECT PERCUSSION
SUBSTANTIAL INDIRECT PERCUSSION
POSSIBLE MINIMAL TO MODERATE PRESSURE SHAPE WITH PRESSURE FLAKER
EDGE UNIT #1
MINIMAL RUB BUFFET WITH HAMMERSTONE AND MINIMAL SHEAR SHAPE WITH PRESSURE FLAKER IN INDICATED AREA
0 5 10 20mm

FIGURE 40

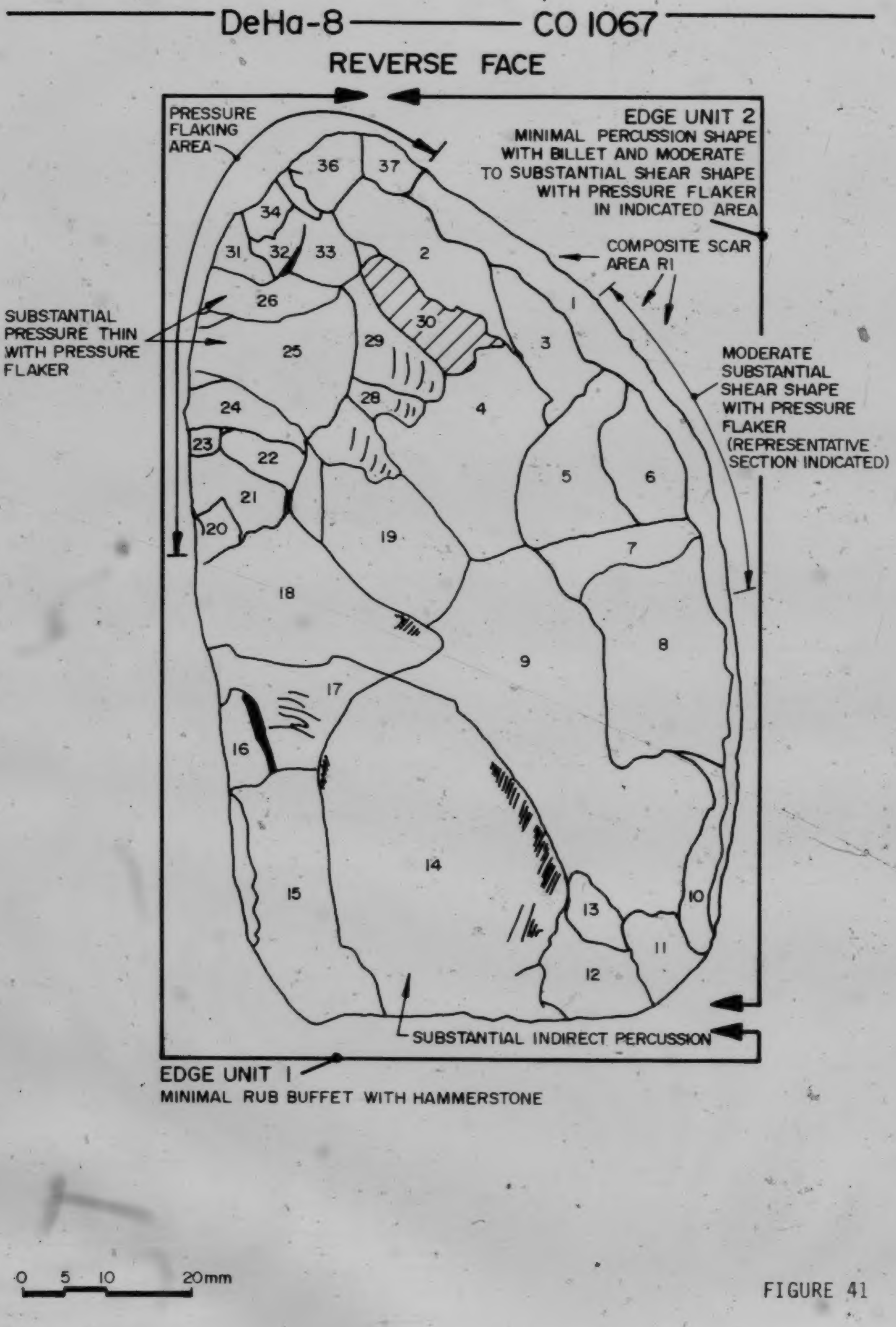

DeHa-8
CO 1067
REVERSE FACE
PRESSURE FLAKING AREA
EDGE UNIT 2
MINIMAL PERCUSSION SHAPE WITH BILLET AND MODERATE TO SUBSTANTIAL SHEAR SHAPE WITH PRESSURE FLAKER IN INDICATED AREA
COMPOSITE SCAR AREA R1
SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
MODERATE SUBSTANTIAL SHEAR SHAPE WITH PRESSURE FLAKER (REPRESENTATIVE SECTION INDICATED)
SUBSTANTIAL INDIRECT PERCUSSION
EDGE UNIT 1
MINIMAL RUB BUFFET WITH HAMMERSTONE
20mm

FIGURE 41

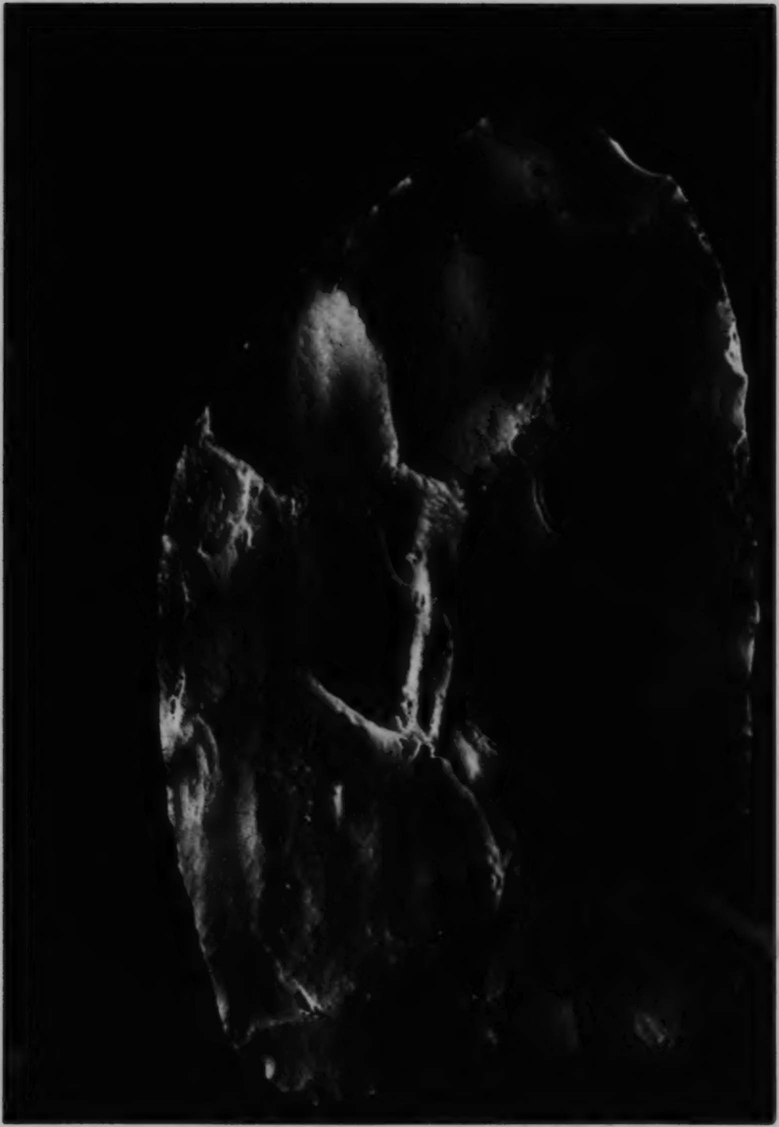


Plate 50: Prehistoric Artifact C01067, Obverse Face.

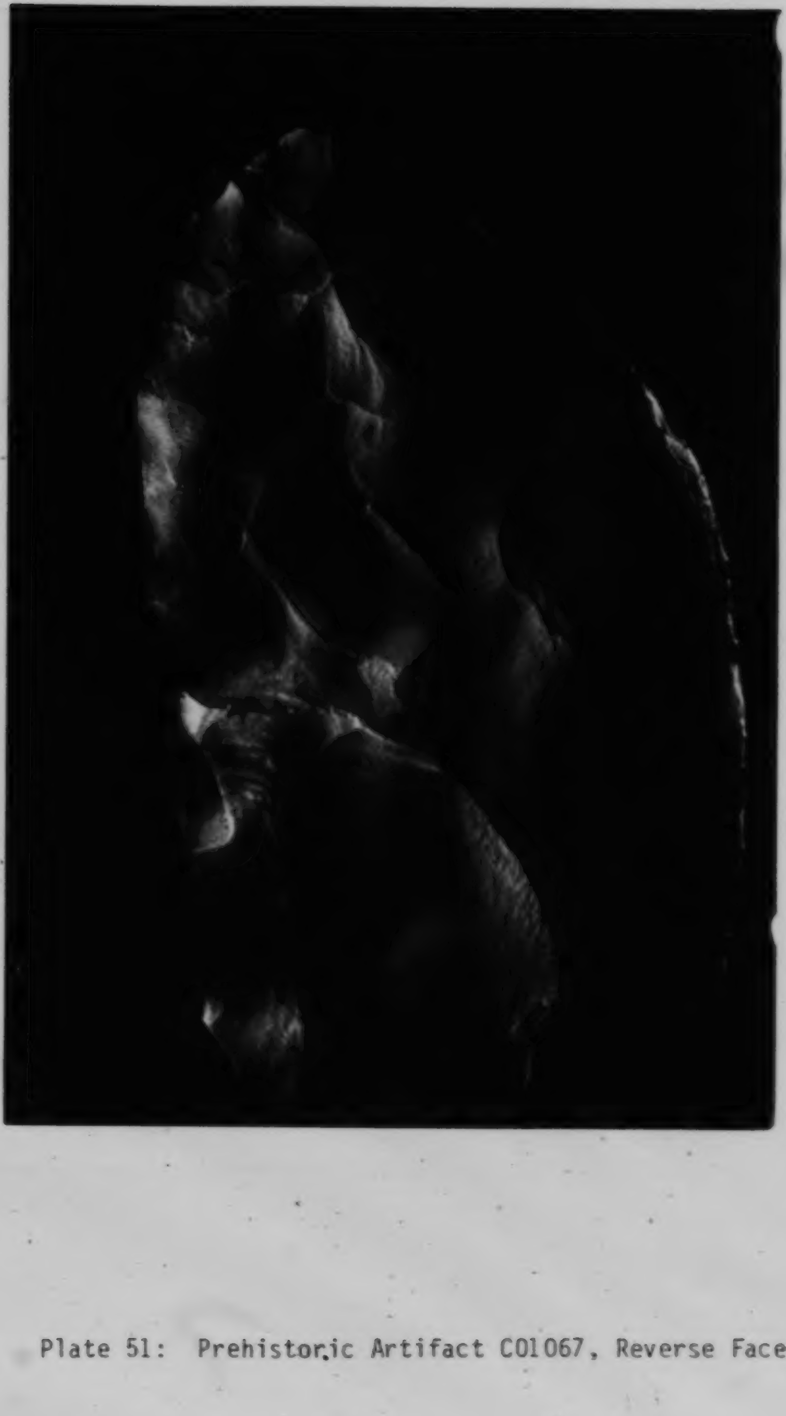


Plate 51: Prehistoric Artifact C01067, Reverse Face.

Table 63: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: DeHa-8 - Jordan

1.3 Specimen Catalogue #: C01071

1.4 Photographic Plate Identification: special negatives

1.5 Standard Artifact Description:

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: Biface

1.8 Flaking (Bifacial/Unifacial): Bifacial

1.9 Metric Size:
length - 25.6 cm
width - 11.2 cm
thickness - 2.0 cm

1.10 Form/Morphology Description:

This specimen (like C01073) is a very large biface (i.e., 25.6 cm long) and, at the same time, is quite thin (2.0 cm) and represents an overall symetrical and well made artifact. The main body thinning flakes are extremely large, thin, and spatulate in shape. Exetnsive thinning and removing of interidge scars has taken place along the lateral margins. As well, the edge has been straightened by smoothing out some of the flat curved notches left by removal of the large thinning flakes. The base is straight but cuts across the artifact at a shallow angle and contains basal thinning flakes. Some water wear is evident on both faces and this may have partially obscured some attributes such as tearing.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # 03	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	see note (1)	1. See scar R33 for edge treatment (edge unit # 1).
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	relatively close together, evenly distributed		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 03, C01071

	Prehistoric C01071 Edge Unit	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet	AB8-6 Sub. Press. Thin P.F.
1.1	moderate	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 80 - 20	+ 1
3.2	gradual	+ 1	+ 80 - 20	+ 1
3.3	thin	+ 80 - 20	+ 80 - 20	+ 1
4.1	present	+ 80 - 20	+ 20 - 80	+ 50 - 50
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. close together, evenly dist.	- 1	- 1	+ 1
4.4	0	+ 60 - 40	+ 80 - 20	+ 75 - 25

5.1	rounded	+ 50 - 50	+ 40 - 60	+ 75 - 25
5.2	step	+ 60 - 40	+ 50 - 50	+ 25 - 75
Total	+	+ 7.30	+ 6.3	+ 8.25
	-	- 2.70	- 3.7	- 1.75
%	+	+ 73	+ 63	+ 83
	-	- 27	- 37	- 17
Score		+ 46	+ 26	+ 66

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 66 Sub. Pressure Thin with P.F.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # 013	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. Edge Unit 1 is coded on the reverse side on scar form for R33.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	distinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	far apart on distal 1/2		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 013, C01071

	Prehistoric C01071 Scar 013	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet
1.1	moderate	+ 1	+ 1
2.1			
2.2			
2.3			
2.4			
3.1	distinct	- 1	+ 20 - 80
3.2	gradual	+ 1	+ 80 - 20
3.3	thin	+ 80 - 20	+ 80 - 20
4.1	present	+ 80 - 20	+ 20 - 80
4.2	indistinct	+ 1	+ 1
4.3	far apart on distal 1/2	- 1	+ 1
4.4	light	- 1	+ 20 - 80

5.1		rounded	+ 50 - 50	+ 40 - 60
5.2		feather	+ 83.4 - 16.6	+ 50 - 50
Total	+		+ 5.93	+ 6.1
	-		- 4.07	- 3.9
%	+		+ 59	+ 61
	-		- 41	- 39
Score			+ 18	+ 22

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Indeterminate + 22 Mod. Perc. Thin Billet

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # 015	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very substantial	(1)	1. Edge Unit 1(b), coded on scar R33.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart evenly dist.		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 015, C01071

	Prehistoric C01071 Scar 015	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.	AB16-17 Mod./Sub. Perc. Thin Hammerstone
1.1	very substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on dist. 1/2	+ 1	+ 1	- 1
4.4	light	+ 25 - 75	+ 33.3 - 66.7	+ 40 - 60

5.1	irregular	+ 50 - 50	+ 66.7 - 33.3	- 1
5.2	feather	+ 25 - 75	+ 1	+ 40 - 60
Total	+	+ 7.5	+ 8	+ 7.4
	-	- 3.5	- 2	- 3.6
%	+	+ 75	+ 80	+ 74
	-	- 35	- 20	- 36
Score		+ 40	+ 60	+ 34

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 60 Sub. Indirect Percussion

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # 025	Edge Treatment on Same Scar	Notes
1.1	Scar Size	minimal (score as moderate)	(1)	1. For edge unit, see scar 031.
2.1	Edge Sharpness			2. Negative percussion bulb not present.
2.2	Margin Damage			
2.3	Microflakes			N.B. Due to the very large size of the prehistoric specimen, the scar is scored as being of moderate size.
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	n/a (2)		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	close together evenly dist.		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 025, C01071

	Prehistoric C01071 Scar 025	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB3-17 Mod. Perc. Shape Hammerstone	AB5-9(b) Mod. Perc. Thin Billet	AB15-18(a) Mod. Perc. Shape Billet	AB8-6 Sub. Press. Thin P.F.
1.1	moderate	+ 1	+ 1	+ 1	+ 1	+ 1
2.1						
2.2						
2.3						
2.4						
3.1	n/a	n/a	n/a	n/a	n/a	n/a
3.2	gradual	+ 1	+ 1	+ 80 - 20	+ 1	+ 1
3.3	thin	+ 80 - 20	+ 1	+ 80 - 20	+ 85.72 - 14.28	+ 1
4.1	present	+ 80 - 20	+ 33.3 - 66.7	+ 20 - 80	+ 14.28 - 85.72	+ 50 - 50
4.2	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
4.3	close together evenly dist.	- 1	- 1	- 1	- 1	- 1
4.4	0	+ 60 - 40	+ 66.7 - 33.3	+ 80 - 20	+ 85.72 - 14.28	+ 75 - 25

5.1	straight	+ 50 - 50	+ 1	+ 60 - 40	+ 57.1 - 42.9	+ 25 - 75
5.2	step	+ 60 - 40	+ 33.3 - 66.7	+ 50 - 50	+ 28.6 - 71.4	+ 25 - 75
Total	+	+ 6.3	+ 6.33	+ 5.7	+ 5.7	+ 6.75
	-	- 2.7	- 2.67	- 3.3	- 3.3	- 2.25
%	+	+ 70	+ 70	+ 63	+ 63	+ 75
	-	- 30	- 30	- 47	- 47	- 25
Score		+ 40	+ 40	+ 16	+ 16	+ 50

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 50 Sub. Press. Thin P.F.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # 031	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very sub.	very minimal (1)	1. Edge Unit 2
2.1	Edge Sharpness		sharp	2. Too indistinct to code.
2.2	Margin Damage		heavy	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		irreg./straight convex projections	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	n/a (2)		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded	curved straight	
5.2	Scar Termination at Distal Edge	feather	feather and step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 031, C01071

	Prehistoric C01071 Scar 031	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion	AB16-17 Mod./Sub. Perc. Thin Hammerstone
1.1	very sub.	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 25 - 75	+ 66.7 - 33.3	+ 60 - 40

5.1	rounded	+ 50 - 50	+ 33.3 - 66.7	+ 40 - 60
5.2	feather	+ 25 - 75	+ 1	+ 40 - 60
Total	+	+ 5.5	+ 7	+ 7
	-	- 3.5	- 2	- 2
%	+	+ 61	+ 78	+ 78
	-	- 39	- 22	- 22
Score		+ 22	+ 56	+ 56

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 56 Sub. Indirect Perc.

The scar is too large for hammerstone and is morphologically more similar to indirect percussion.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 031, C01071, Edge Unit #2

	Prehistoric C01071 Edge Unit #2	AB5-18(b) Min. Perc. Shape Hammerstone	AB5-9(a) Min. Perc. Thin Hammerstone	AB6-13(b) Mod./Sub. Shear Shape P.F.	AB2-2 Min. Press. Rub with P.F.
1.1	very minimal	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 1
2.2	heavy	+ 1	+ 1	+ 1	+ 1
2.3	heavy	+ 80 - 20	+ 1	+ 1	+ 1
2.4	irreg./straight convex projections	+ 1	+ 1	+ 1	+ 84 - 16
3.1					
3.2					
3.3					
4.1					
4.2					
4.3					
4.4					

5.1	rounded & straight	+ 50 - 50	+ 56 - 44	+ 44 - 56	+ 1
5.2	feather and step	+ 1	+ 1	+ 1	+ 1
Total	+	+ 6.3	+ 6.56	+ 6.44	+ 6.84
	-	- .7	- .44	- .56	- .16
%	+	+ 90	+ 94	+ 92	+ 98
	-	- 10	- 6	- 8	- 2
Score		+ 80	+ 88	+ 84	+ 96

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

N.B.

Note that the above units are very close in morphology and it is difficult to separate them or distinguish between them.

As the other two units on edge units 1 and 2 are either min. pressure rub with p.f. or mod./sub. shear shape with p.f., and as min. press. rub with p.f. scored the highest, this unit has been selected here, based on this secondary evidence, highly probable + 96 min. pressure rub with p.f.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # R5	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. Edge Unit 2 (see scar 031).
2.1	Edge Sharpness	sharp		
2.2	Margin Damage	0		
2.3	Microflakes	0		
2.4	Proximal Edge Morphology	flat curved notch		
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on distal 1/2		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R5, C01071

	Prehistoric C01071 Scar R5	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB5-9(b) Mod. Perc. Thin Billet	AB8-6 Sub. Perc. Thin P.F.
1.1	moderate	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 1
2.2	0	+ 1	+ 50 - 50	+ 40 - 60	+ 50 - 50
2.3	0	+ 60 - 40	+ 1	+ 60 - 40	+ 1
2.4	flat curved notch	+ 1	+ 75 - 25	+ 1	- 1
3.1	indistinct	+ 1	+ 75 - 25	+ 80 - 20	+ 1
3.2	gradual	+ 1	+ 75 - 25	+ 80 - 20	+ 1
3.3	thin	+ 80 - 20	+ 75 - 25	+ 80 - 20	+ 1
4.1	present	+ 80 - 20	+ 50 - 50	+ 20 - 80	+ 50 - 50
4.2	indistinct	+ 1	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	- 1	+ 1	+ 1	- 1
4.4	light	+ 40 - 60	+ 25 - 75	+ 20 - 80	+ 25 - 75

5.1	rounded	+ 40 - 60	+ 50 - 50	+ 40 - 60	+ 75 - 25
5.2	feather	+ 40 - 60	+ 25 - 75	+ 50 - 50	+ 75 - 25
Total	+	+ 0.4	+ 10.0	+ 9.7	+ 9.75
	-	- 3.6	- 4.0	- 4.3	- 4.25
%	+	+ 74	+ 71	+ 69	+ 70
	-	- 26	- 29	- 31	- 30
Score		+ 48	+ 42	+ 38	+ 40

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 42 Sub. Perc. Thin Billet

Based on the rib distribution, the scar is identified as moderate/substantial percussion thin with billet.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # R15	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	(1)	1. Edge Unit 2 See scar 031.
2.1	Edge Sharpness	n/a		2. Too indistinct to code.
2.2	Margin Damage	n/a		
2.3	Microflakes	n/a		
2.4	Proximal Edge Morphology	flat curved notch		
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on distal 1/2		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R15, C01071

	Prehistoric C01071 Scar R15	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion	AB16-7 Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4	flat curved notch	+ 1	+ 1	+ 1
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	+ 1	+ 1	- 1
4.4	light			

5.1	irregular	+ 50 - 50	+ 66.7 - 33.3	- 1
5.2	feather	+ 25 - 75	+ 1	+ 40 - 60
Total	+	+ 7.5	+ 9	+ 7.4
	-	- 3.5	- 2	- 3.6
%	+	+ 68	+ 82	+ 67
	-	- 39	- 18	- 33
Score		+ 29	+ 64	+ 44

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 64 Sub. Indirect Percussion

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # R17	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. Edge Unit 2 (see scar 031).
2.1	Edge Sharpness			2. Ribs appear to be natural or from an earlier scar - not used for scoring.
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	n/a (2)		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R17, C01071

	Prehistoric C01071 R17	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet	AB8-6 Sub. Perc. Thin with P.F.
1.1	moderate	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 80 - 20	+ 1
3.2	gradual	+ 1	+ 80 - 20	+ 1
3.3	thin	+ 80 - 20	+ 80 - 20	+ 1
4.1	present	+ 80 - 20	+ 20 - 80	+ 50 - 50
4.2	indistinct	+ 1	+ 1	+ 1
4.3	n/a	n/a	n/a	n/a
4.4	light	- 1	+ 20 - 80	+ 25 - 75

5.1	rounded	+ 50 - 50	+ 40 - 60	+ 75 - 25
5.2	feather	+ 83.4 - 16.6	+ 50 - 50	+ 75 - 25
Total	+	+ 6.93	+ 5.7	+ 7.25
	-	- 2.07	- 3.3	- 1.75
%	+	+ 77	+ 63	+ 81
	-	- 23	- 37	- 19
Score		+ 54	+ 26	+ 62

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 82 Substantial Pressure Thin with Pressure Flaker.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # R19	Edge Treatment on Same Scar	Notes
		(1)	(2)	
1.1	Scar Size	minimal (score as mod.)		1. Due to the very large size of the prehistoric artifact, the scar will be scored as moderate in size. 2. Edge Unit 2 (see scar 031).
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. close together & evenly dist.		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R19, C01071

	Prehistoric C01071 Scar R19	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB3-17 Mod. Perc. Shape Hammerstone	AB5-9(b) Mod. Perc. Thin Billet	AB15-18(a) Mod. Perc. Shape Billet	AB8-6 Sub. Pressure Thin P.F.
1.1	moderate	+ 1	+ 1	+ 1	+ 1	+ 1
2.1						
2.2						
2.3						
2.4						
3.1	indistinct	+ 1	+ 1	+ 80 - 20	+ 85.72 - 14.28	+ 1
3.2	gradual	+ 1	+ 1	+ 80 - 20	+ 1	+ 1
3.3	thin	+ 80 - 20	+ 1	+ 80 - 20	+ 85.72 - 14.28	+ 1
4.1	present	+ 80 - 20	+ 33.3 - 66.7	+ 20 - 80	+ 14.28 - 85.72	+ 50 - 50
4.2	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
4.3	rel. close together & evenly dist.	- 1	- 1	- 1	- 1	+ 1
4.4	0	+ 60 - 40	- 1	+ 40 - 60	+ 85.72 - 14.28	+ 75 - 25

5.1		rounded	+ 50 - 50	- 1	+ 40 - 60	+ 42.9 - 57.1	+ 75 - 25
5.2		feather	+ 83.4 - 16.6	+ 33.3 - 66.7	+ 50 - 50	+ 71.4 - 28.6	+ 75 - 25
Total	+		+ 7.53	+ 5.67	+ 5.9	+ 6.9	+ 8.75
	-		- 2.57	- 4.33	- 4.1	- 3.1	- 1.25
%	+		+ 75	+ 57	+ 59	+ 69	+ 88
	-		- 25	- 43	- 41	- 31	- 12
Score			+ 50	+ 14	+ 18	+ 38	+ 76

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 76 Sub. Pressure Thin P.F.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # R24	Edge Treatment on Same Scar	Notes
1.1	Scar Size	min. - mod. (score as mod.)	very minimal (1)	1. Edge Unit 3 - scars 22-27 reverse face and scars 17-21 obverse face.
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		light	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		irreg./straight convex projections	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	irregular	rounded (some straight)	
5.2	Scar Termination at Distal Edge	feather	step/feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R24, C01071

	Prehistoric C01071 Scar R24	AB9-5 Mod. Perc. Thin Billet	AB3-17 Mod. Perc. Shape Hammerstone	AB16-7(a) Sub./Mod. Perc. Thin Hammerstone	AB8-6 Sub. Pressure Thin with P.F.	AB12-19 Sub. Perc. Shape Billet
1.1	moderate	+ 1	+ 1	+ 1	+ 1	+ 1
2.1						
2.2						
2.3						
2.4						
3.1	indistinct	+ 80 - 20	+ 1	+ 1	+ 1	+ 1
3.2	gradual	+ 80 - 20	+ 1	+ 1	+ 1	+ 1
3.3	thin	+ 80 - 20	+ 1	+ 80 - 20	+ 1	+ 75 - 25
4.1	present	+ 20 - 80	+ 33.3 - 66.7	+ 80 - 20	+ 50 - 50	+ 25 - 75
4.2	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
4.3	n/a					
4.4	0	+ 80 - 20	+ 66.7 - 33.3	+ 60 - 40	+ 75 - 25	+ 75 - 25

5.1	irregular	- 1	- 1	- 1	- 1	- 1
5.2	feather	+ 50 - 50	+ 33.3 - 66.7	+ 40 - 60	+ 75 - 25	+ 1
Total	+	+ 5.90	+ 6.33	+ 6.60	+ 7	+ 6.75
	-	- 3.10	- 2.67	- 2.40	- 2	- 2.25
%	+	+ 66	+ 70	+ 73	+ 77	+ 75
	-	- 34	- 30	- 27	- 23	- 25
Score		+ 32	+ 40	+ 46	+ 54	+ 50

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 54 - Sub. Pressure Thin with Pressure Flaker

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C01071, Edge Unit #3 (Scored on Scar R24)

	Prehistoric C01071 Edge Unit 3	AB2-2(b) Min. Press. Rub with P.F.	AB16-13(a) Min. Shear Shape with P.F.	AB6-13(b) Mod./Sub. Shear Shape with P.F.	AB10-1(b) Min. Rub Buffet Billet	AB16-7(b) Min. Perc. Thin Hammerstone
1.1	very minimal	+ 1	+ 1	+ 1	+ 1	- 1
2.1	sharp	+ 1	+ 33.3 - 66.7	+ 1	- 1	+ 1
2.2	light	- 1	+ 16.7 - 83.3	- 1	+ 15 - 85	- 1
2.3	heavy	+ 1	+ 66.7 - 33.3	+ 1	- 1	+ 50 - 50
2.4	irreg./straight convex projections	+ 84 - 16	+ 1	+ 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1		rounded (some straight)	+ 80 - 20	+ 50 - 50	+ 44 - 56	- 1	+ 75 - 25
5.2		step/ feather	+ 1	+ 20 - 80	+ 1	+ 20 - 80	+ 1
Total	+		+ 5.64	+ 3.9	+ 5.44	+ 2.35	+ 4.25
	-		- 1.36	- 3.1	- 1.56	- 4.65	- 2.75
%	+		+ 81	+ 56	+ 78	+ 34	+ 61
	-		- 19	- 44	- 22	- 66	- 39
Score			+ 62	+ 12	+ 56	- 32	+ 22

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 62 - Min. Press. Rub with P.F.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # R33	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	very minimal (1)	1. Edge Unit 1 (scars 26-46 reverse face).
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		light	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		irregular or straight with convex proj.	
3.1	Negative Bulb of Force	distinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	irregular	straight/ irregular	
5.2	Scar Termination at Distal Edge	feather	pred. step some feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R33, C01071

	Prehistoric C01071 Scar R33	AB11-11 Sub. Indirect Percussion	AB7-10 Sub. Perc. Thin Billet	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	distinct	+ 33.3 - 66.7	+ 25 - 75	- 1
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 1	+ 50 - 50	+ 80 - 20
4.1	0	+ 66.7 - 33.3	+ 50 - 50	+ 20 - 80
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 66.7 - 33.3	+ 75 - 25	- 1

5.1	irregular	+ 66.7 - 33.3	+ 50 - 50	+ 40 - 60
5.2	feather	+ 1	+ 50 - 50	+ 40 - 60
Total	+	+ 6.33	+ 4.75	+ 3.8
	-	- 1.67	- 3.25	- 4.2
%	+	+ 79	+ 59	+ 48
	-	- 21	- 41	- 52
Score		+ 58	+ 18	- 4

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 58 - Sub. Indirect Percussion

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C01071 Edge Unit 1 (Scored on Scar R33 Form)

	Prehistoric C01071 Edge Unit 1(b)	AB2-2(b) Min. Press. Rub P.F.	AB6-13(a) Min. Shear Shape P.F.	AB6-13(b) Mod./Sub. Shear Shape P.F.	AB10-1(b) Min. Rub Buffet Billet	AB10-1(a) Min. Rub Buffet Hammerstone
1.1	very minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 33.3 - 66.7	+ 1	- 1	- 1
2.2	light	- 1	+ 16.7 - 83.3	- 1	+ 15 - 85	- 1
2.3	heavy	+ 1	+ 66.7 - 33.3	+ 1	- 1	+ 1
2.4	irreg./straight convex proj.	+ 84 - 16	+ 1	+ 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight/irreg.	+ 50 - 50	+ 1	+ 1	+ 20 - 80	+ 75 - 25
5.2	pred. step some feather	+ 1	+ 20 - 80	+ 50 - 50	- 1	+ 80 - 20
Total	+	+ 5.34	+ 4.37	+ 5.5	+ 2.35	+ 4.55
	-	- 1.66	- 2.63	- 1.5	- 4.65	- 2.45
%	+	+ 76	+ 62	+ 79	+ 34	+ 65
	-	- 24	- 38	- 21	- 66	- 35
Score		+ 52	+ 24	+ 58	+ 32	+ 30

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 58 - Mod./Sub. Shear Shape P.F.
* Possible + 52 - Min. Press. Rub P.F.

* After comparing the experimental specimen morphology and considering that the adjacent edge unit #3 is also min. pressure rub with p.f., the above identification was made.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C01071	Main Flake Scar # R38	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very sub.	(1)	1. Edge unit 1(b) - see scar R33.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	distinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	0		
4.3	Rib Spacing And Distribution	0		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R38, C01071

	Prehistoric C01071 Scar R38	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.
1.1	very substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	distinct	- 1	+ 25 - 75	+ 33.3 - 66.7
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1
4.1	0	+ 20 - 80	+ 50 - 50	+ 66.7 - 33.3
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 60 - 40	+ 75 - 25	+ 66.7 - 33.3

5.1	irregular	- 1	+ 50 - 50	+ 66.7 - 33.3
5.2	feather	+ 1	+ 1	+ 1
Total	+	+ 4.6	+ 5.25	+ 6.33
	-	- 3.4	- 2.75	- 1.67
%	+	+ 58	+ 66	+ 79
	-	- 42	- 34	- 21
Score		+ 16	+ 32	+ 58

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 58 - Sub. Indirect Perc.

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact, C01071 - Page 1 (Jordan)

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
03		Possible	+ 66	Substantial Pressure Thine with P.F.	AB8-6
013		Indeterminate	+ 22	Mod. Perc. Thin Billet	AB5-9(a)
015		Possible	+ 64	Sub. Indirect Percussion	AB11-11
025		Possible	+ 50	Sub. Pressure Thin P.F. N.B. Minimum and moderate pressure thinning is also present on artifact.	AB8-6
031		Possible	+ 56	Sub. Indirect Percussion	AB11-11
	Edge Unit # 2	Highly Probable	+ 96	Minimum Pressure Rub with P.F.	AB2-2(b)
R5		Possible	+ 42	Mod./Sub. Percussion Thin Billet	AB7-10
R15		Possible	+ 64	Sub. Indirect Percussion	AB11-11
R17		Possible	+ 62	Sub. Pressure Thin with P.F.	AB8-6
R19		Highly Probable	+ 76	Sub. Pressure Thin P.F.	AB8-6

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact, C01071 - Page 2 (Jordan)

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
R24		Possible	+ 54	Sub. Pressure Thin with P.F.	AB8-6
	Edge Unit #3	Possible	+ 62	Min. Press. Rub with P.F.	AB2-2(b)
R33		Possible	+ 58	Sub. Indirect Percussion	AB11-1
	Edge Unit # 1	Possible	+ 52	Min. Press. Rub with P.F. [overlaps unit 1(a)]	AB2-2(b)
R38		Possible	+ 58	Sub. Indirect Percussion	

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units:

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Substantial Indirect Percussion Thinning: This unit was the major means of thinning the specimen, and five flakes (015, 031, R15, R33, and R38) have been identified as pertaining to this behavior unit. Indirect percussion is a billet on billet technique which produces flakes having the morphological characteristics between those of hammerstone/pressure and billet. The flakes are extremely large and spatulate, generally with irregular feathered terminations. Production Unit Code is 40:5, 51,51.

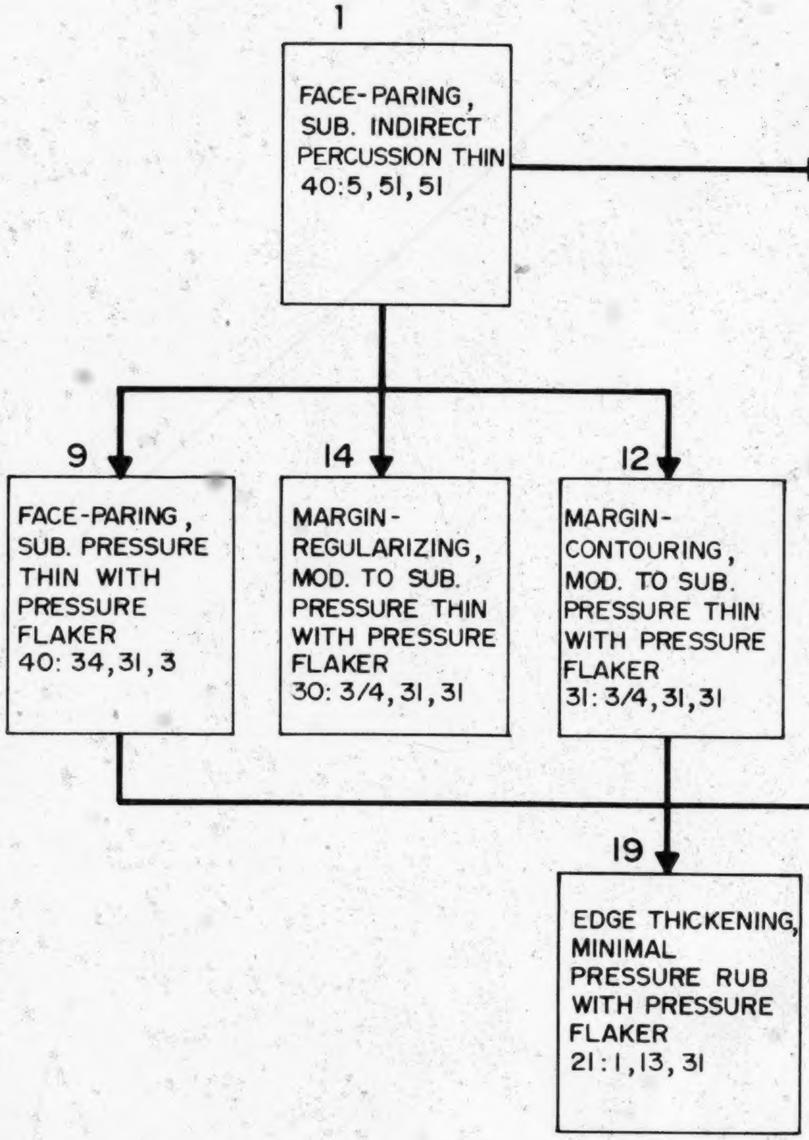
(b) Mod./Sub. Percussion Thin with Billet: Identified from flakes 013 and R5, this unit was sparingly used for face paring or thinning. Production Unit Code is 40:3, 41, 41.

3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

There are extensive isolated or small groups of pressure flakes (mod. to sub.) (see scars 025, R19) on the artifact. The units were used for secondary face paring margin contouring and for removal of inter-ridge scars or margin regularizing. Although most scars coded (03, R17, R19, R4) are substantial, minimum and moderate scars are also present. Production Unit Code is 30/31/40:2/3/4, 31, 31.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

(a) Minimum Pressure Rub with Pressure Flaker: This unit, coded and identified from edge units 1, 2 and 3, was applied to all external margins of the artifact. Some areas of mod./sub. shear shaping may also have been undertaken but as the morphology of the two units is very similar, these cannot be readily identified. A pressure rub involves the use of the end of a pressure flaker to rub across the edge of an artifact - this removes any overly thin material and strengthens the edge. The resulting margin is characteristically rough with small convex projections and some minimal flake removals. Margin damage and micro flakes are two of the morphologies associated with this unit. Production Code Unit is 21:2, 13, 31.


1
FACE-PARING, SUB. INDIRECT PERCUSSION THIN
40:5, 51, 51
2
FACE-PARING, MOD. TO SUB. PERCUSSION THIN WITH BILLET
40: 3, 41, 41
9
FACE-PARING, SUB. PRESSURE THIN WITH PRESSURE FLAKER
40: 34, 31, 3
14
MARGIN-REGULARIZING, MOD. TO SUB. PRESSURE THIN WITH PRESSURE FLAKER
30: 3/4, 31, 31
12
MARGIN-CONTOURING, MOD. TO SUB. PRESSURE THIN WITH PRESSURE FLAKER
31: 3/4, 31, 31
10
FACE-PARING, MINIMAL PRESSURE THIN WITH PRESSURE FLAKER
30/40: 2, 31, 31
19
EDGE THICKENING, MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
21: 1, 13, 31

(b) Reconstructing Sequencing of Production Units: C01071

3.4 Flow Diagram of Production Units (above)

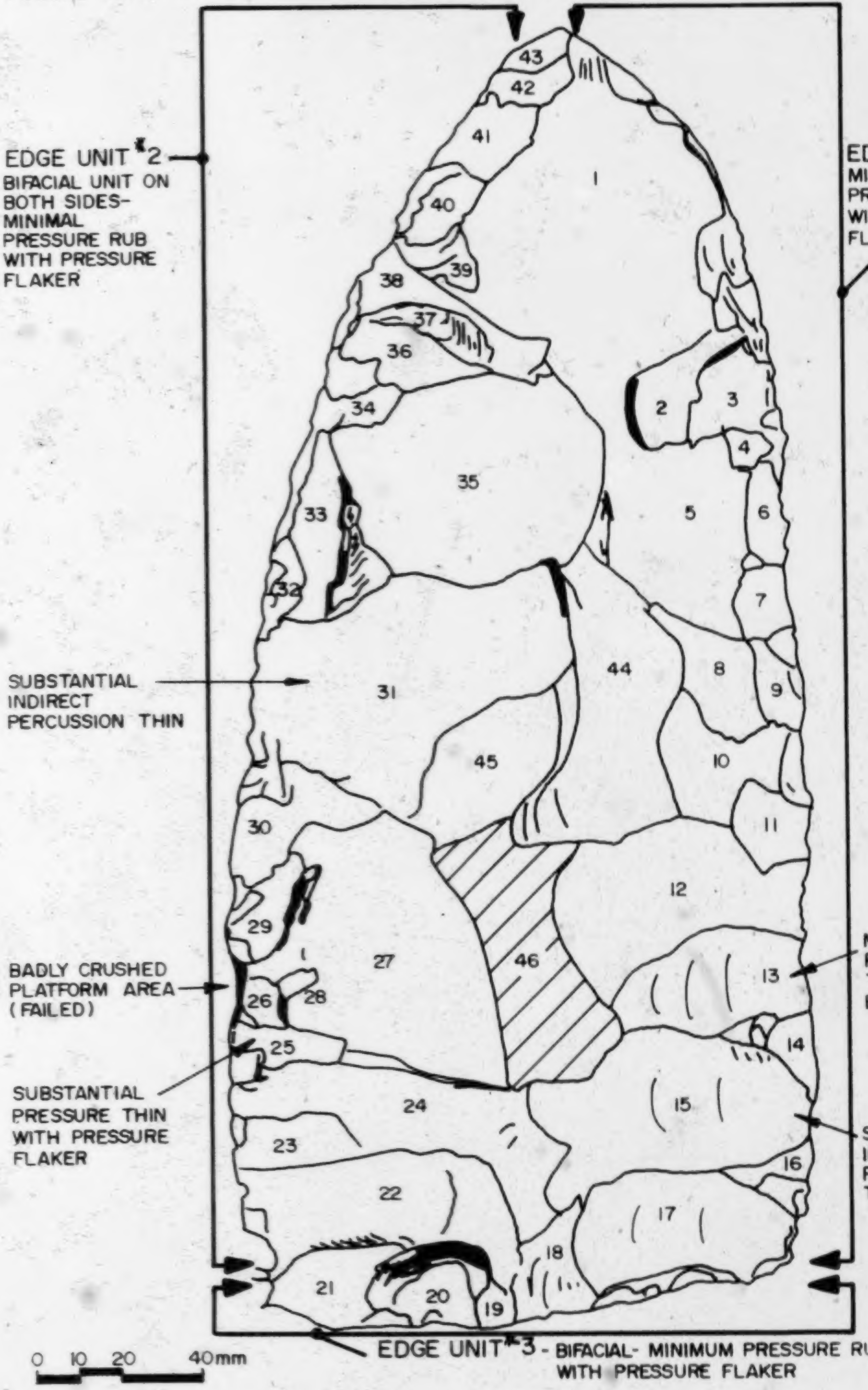
3.5 Description and Discussion of Technological Grammar Found on Artifact

This is one of two extremely large bifaces analyzed as part of the Jordan site collection (DeHa-8). The manufacture of this specimen (C01071) is essentially identical to the other specimen (C01073) except that more widespread use is made of pressure flaking units, replacing billet percussion to a minor extent. The technological basis of this specimen consists of six behavior units. The major production unit positively identified from analysis of five scars (015, 031, R15, R33, R38) is substantial indirect percussion face paring. This was the major technique used to reduce (thin) the specimen. Along the right obverse lateral margin some percussion thinning flakes were removed by billet work. Other billet flakes may also be present but they are not concentrated at any one spot. One positive flake scar identification (013) was made regarding this unit. The primary indirect percussion and secondary billet face paring was followed up in places by minimum, moderate and substantial pressure thinning with a pressure flaker. Both types of secondary face paring appear to have served to remove some of the inter-flake scar ridges (margin-regularizing) and perhaps some margin-contouring. Margin contouring involves increasing the edge angle to form a strong bifacial edge. Identified scars are (03, R17, R19, R24). The final step in the manufacture of this specimen was to treat the edges with a minimum pressure rub with a pressure flaker. Like the other large biface, virtually all edges were treated (i.e., Edge Units 1, 2 and 3). Pressure rubbing removes any overly thin material on the edge, blunts and rounds it, thereby adding considerable strength to the margin. The specimen is complete and has not been broken.

DeHa-8 — CO 1071

FIGURE 42

OBVERSE FACE



EDGE UNIT #2 BIFACIAL UNIT ON BOTH SIDES- MINIMAL PRESSURE RUB WITH PRESSURE FLAKER

EDGE UNIT #1 MINIMAL PRESSURE RUB WITH PRESSURE FLAKER

SUBSTANTIAL INDIRECT PERCUSSION THIN

MODERATE PERCUSSION THIN WITH BILLET

BADLY CRUSHED PLATFORM AREA (FAILED)

SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER

SUBSTANTIAL INDIRECT PERCUSSION THIN

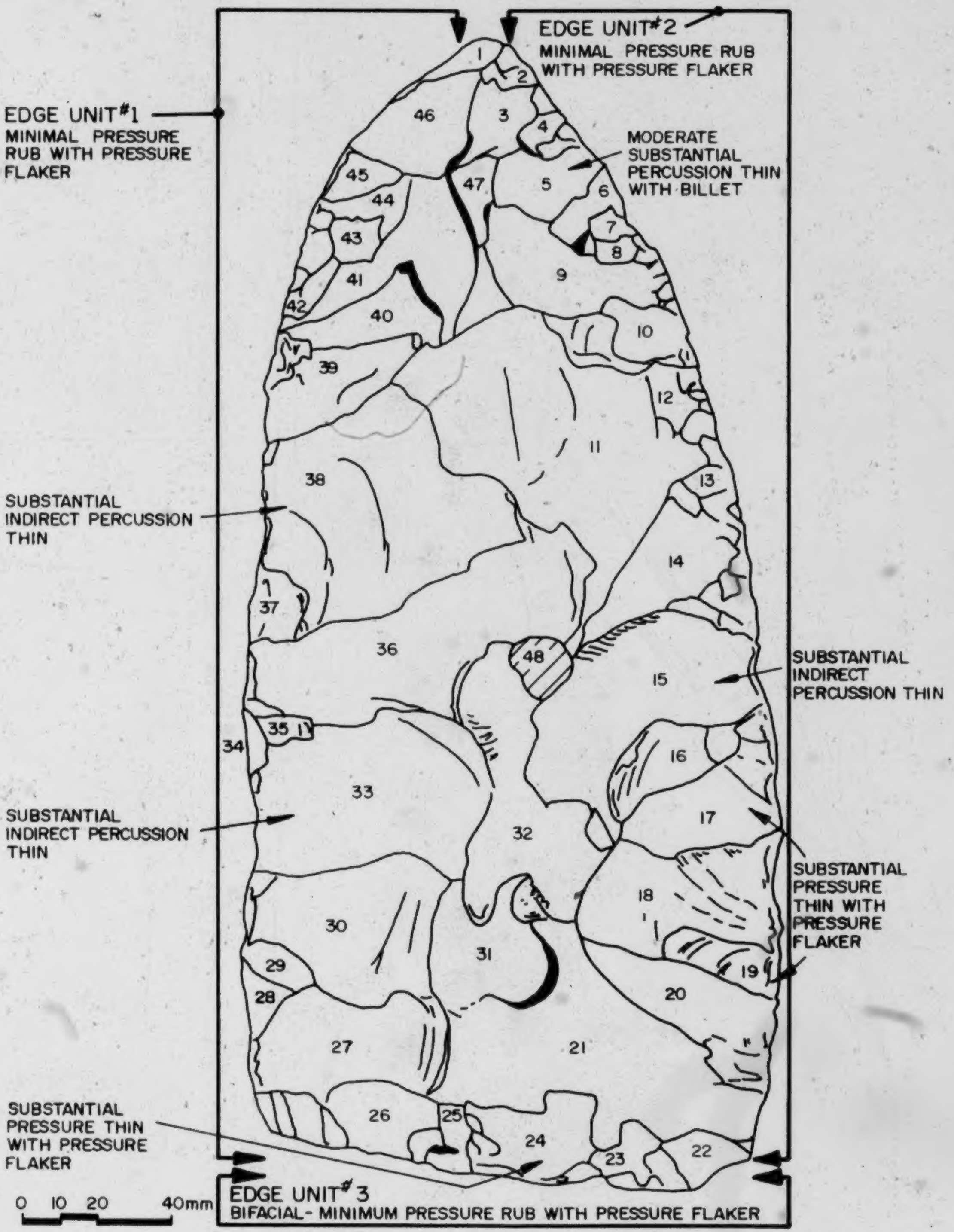
EDGE UNIT #3 - BIFACIAL- MINIMUM PRESSURE RUB WITH PRESSURE FLAKER

43
42
41
1
40
39
38
37
36
2
3
4
34
35
5
6
33
32
7
31
44
8
9
45
10
30
11
12
29
27
46
13
26
28
25
14
24
15
23
16
22
17
18
21
20
19
0 10 20 40mm

DeHa-8 — CO 1071

FIGURE 43

REVERSE FACE


EDGE UNIT#2
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
EDGE UNIT#1
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
MODERATE SUBSTANTIAL PERCUSSION THIN WITH BILLET
SUBSTANTIAL INDIRECT PERCUSSION THIN
SUBSTANTIAL INDIRECT PERCUSSION THIN
SUBSTANTIAL INDIRECT PERCUSSION THIN
SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
EDGE UNIT# 3
BIFACIAL- MINIMUM PRESSURE RUB WITH PRESSURE FLAKER
0 10 20 40mm
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
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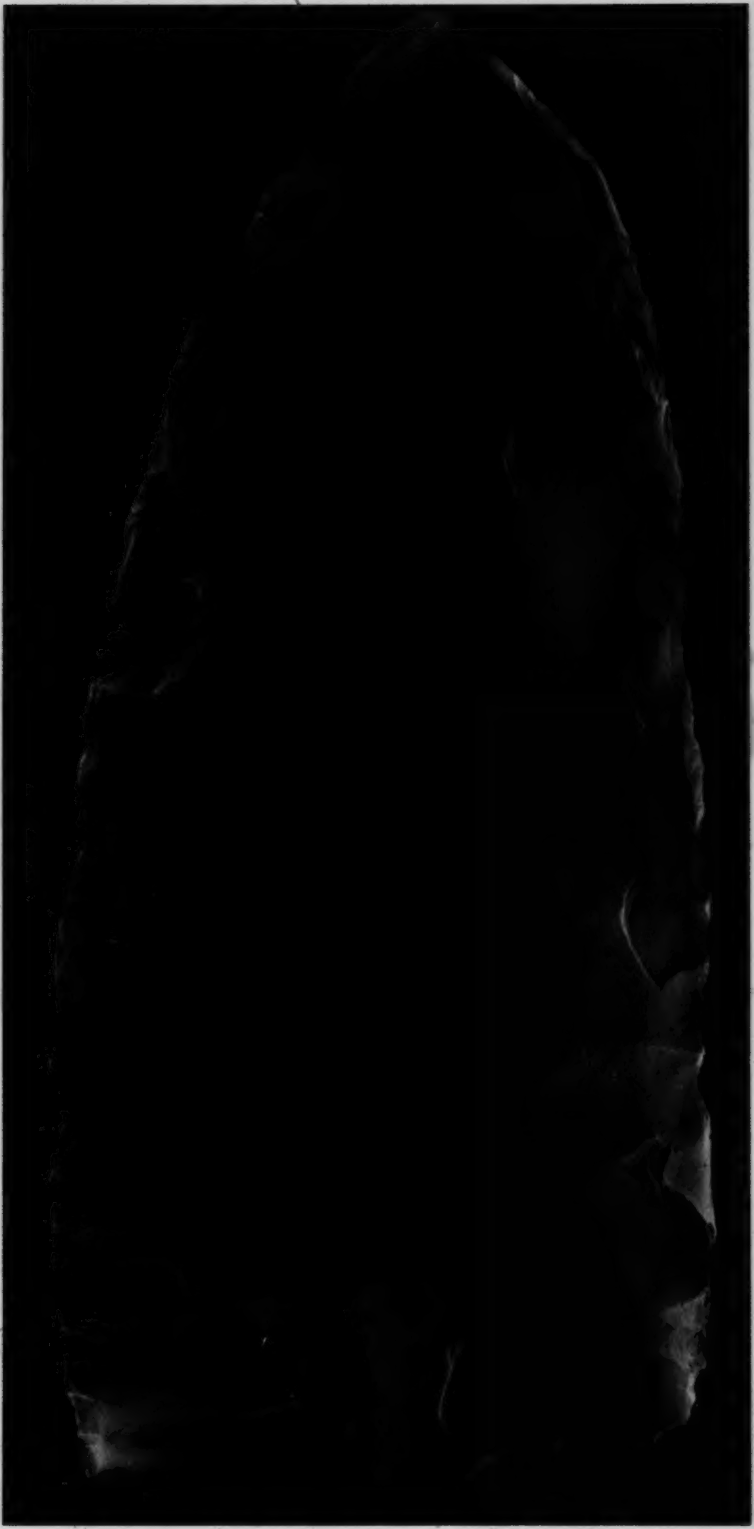


Plate 52. Prehistoric Artifact C01071, Obverse Face.

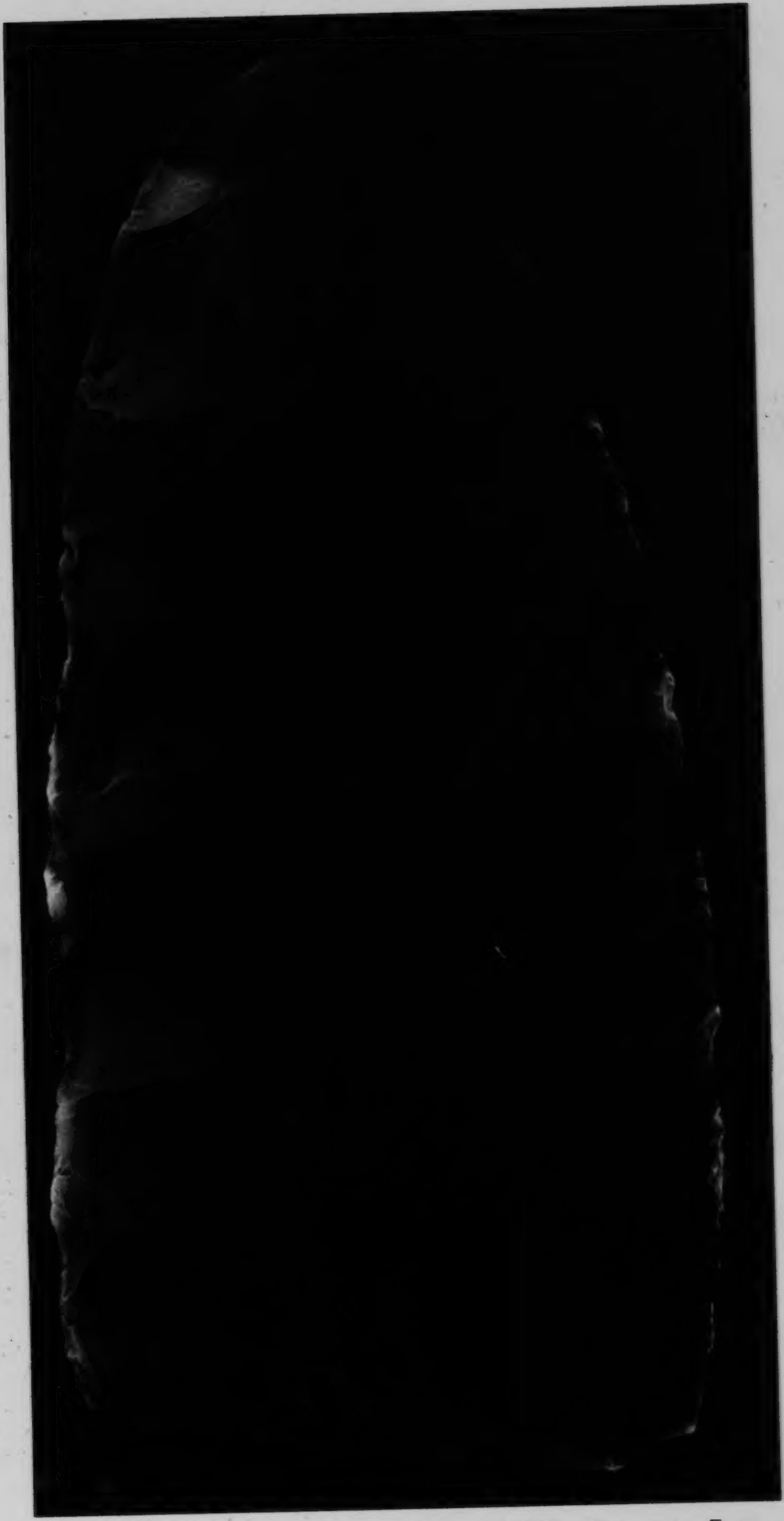


Plate 53. Prehistoric Artifact C01071, Reverse Face.

Table 64: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: DdGw-2 (Jessup Site)

1.3 Specimen Catalogue #: C02169

1.4 Photographic Plate Identification: Roll 3, B3, #17
Roll 3, B3, #35

1.5 Standard Artifact Description:

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: Biface

1.8 Flaking (Bifacial/Unifacial): Bifacial

1.9 Metric Size: length - 10.53
width - 4.38
thickness - 1.41

1.10 Form/Morphology Description:

This is a broad biface with a broad but shallow convex to straight base with rounded corners. The specimen snapped bilaterally during the finishing process near the proximal (tip) end of the specimen.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02169	Main Flake Scar # 08	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	minimal (1)	1. Edge Unit 1 - see area covered on diagram, covers flake scars 7-11 obverse face, scars 30-37 reverse face.
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		heavy	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		straight with convex projections	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	absent		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded	straight/ rounded	
5.2	Scar Termination at Distal Edge	step	pred. step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 08, C02169

	Prehistoric C02169 Scar 08	AB16-7(a) Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.6 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1
4.1	absent	+ 20 - 80	- 1	+ 66.7 - 33.3
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 60 - 40	+ 75 - 25	+ 66.6 - 33.3

5.1		rounded	+ 40 - 60	+ 50 - 50	+ 33.3 - 66.7
5.2		step	+ 60 - 40	+ 75 - 25	- 1
Total	+		+ 5.6	+ 5.0	+ 5.33
	-		- 2.4	- 3.0	- 2.67
%	+		+ 80	+ 62.5	+ 67
	-		- 30	- 37.5	- 33
Score			+ 50	+ 25	+ 34

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 50 Identification - Sub. Percussion Thin with Hammerstone

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02169, Edge Unit 1

	Prehistoric C02169 Edge Unit 1	AB6-13(a) Min. Shear Shape with P.F.	AB6-13(b) Mod. Shear Shape with P.F.	AB2-2(b) Min. Press. Rub with P.F.	AB14-16(b) Min. Perc. Shape with Hammerstone	AB15-18(b) Min. Perc. Shape Billet
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 33.3 - 66.6	+ 1	+ 1	+ 16.7 - 83.3	+ 1
2.2	heavy	- 1	+ 1	+ 1	+ 1	+ 1
2.3	heavy	+ 66.6 - 33.4	+ 1	+ 1	- 1	+ 80 - 20
2.4	straight with convex project.	+ 1	+ 1	+ 84 - 16	+ 83.3 - 16.6	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight/ rounded	+ 50 - 50	+ 44 - 56	+ 1	+ 1	+ 1
5.2	predominantly step	- 1	+ 22.3 - 77.7	+ 50 - 50	+ 33.3 - 66.6	+ 20 - 80
Total	+	+ 3.5	+ 5.66	+ 6.34	+ 4.33	+ 6
	-	- 3.5	- 1.34	- .66	- 2.67	- 1
%	+	+ 50	+ 81	+ 91	+ 62	+ 86
	-	- 50	- 19	- 9	- 38	- 14
Score		0	+ 62	+ 82	+ 24	+ 72

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

* (a) Highly Probable + 82 Minimum Pressure Rub with Pressure Flaker
(b) Highly Probable + 72 Minimum Percussion Shape Billet
(c) Possible + 62 Moderate Shear Shape with Pressure Flaker

* selected unit

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02169	Main Flake Scar # 024	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very sub.	(2)	1. This flake removal broke the specimen, therefore, the edge cannot be coded with certainty. 2. See scar # R14 for edge unit 2 treatment.
2.1	Edge Sharpness	sharp		
2.2	Margin Damage	n/a (1)		
2.3	Microflakes	n/a (1)		
2.4	Proximal Edge Morphology	n/a (1)		
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 024, C02169

	Prehistoric C01083 Scar 024	AB7-10 Sub. Perc. Thin with Billet	AB8-6 Sub. Press. Thin with P.F.	AB16-7(a) Mod. Perc. Thin with Hammerstone
1.1	very sub.	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1
2.2	n/a	n/a	n/a	n/a
2.3	n/a	n/a	n/a	n/a
2.4	n/a	n/a	n/a	n/a
3.1	indistinct	+ 75 - 25	+ 1	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 50 - 50	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	far apart and evenly dist.	- 1	- 1	- 1
4.4	light	+ 25 - 75	+ 25 - 75	+ 40 - 60

5.1	irregular	+ 50 - 50	- 1	- 1
5.2	step	+ 75 - 25	+ 25 - 75	+ 60 - 40
Total	+	+ 7	+ 7	+ 8.6
	-	- 4	- 4	- 2.4
%	+	+ 64	+ 64	+ 78
	-	- 36	- 36	- 22
Score		+ 28	+ 28	+ 56

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

* (a) Possible + 56 - Mod./Sub. Perc. Thin Hammerstone

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02169	Main Flake Scar # 027	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very substantial	(1)	1. Edge Unit 2 scars not present. This edge was used as a platform. There are not enough codable attributes to make an identification on this side of specimen (see scar R14).
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on dist. 1/2		
4.4	Tearing	heavy		
5.1	Scar Shape at Distal Edge	irregular		
5.2	Scar Termination at Distal Edge	feather and step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 027, C02169

	Prehistoric C02169 Scar 027	AB7-10 Sub. Perc. Thin Billet	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	very substantial	+ 1	+ 1
2.1			
2.2			
2.3			
2.4			
3.1	indistinct	+ 75 - 25	+ 1
3.2	gradual	+ 75 - 25	+ 1
3.3	thin	+ 50 - 50	+ 80 - 20
4.1	present	+ 50 - 50	+ 80 - 20
4.2	indistinct	+ 50 - 50	+ 1
4.3	rel. far apart on distal 1/2	+ 1	- 1
4.4	heavy	- 1	- 1

5.1	irregular	+ 50 - 50	- 1
5.2	feather and step	+ 1	+ 1
Total	+	+ 7.0	+ 6.6
	-	- 3.0	- 3.4
%	+	+ 70	+ 66
	-	- 30	- 34
Score		+ 40	+ 32

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

N.B. Scar not useable. Upon re-examination, it appears to be comprised of two scars, not one. Not included in analysis.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02169	Main Flake Scar # R14	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	minimal (1)	1. Edge Unit area 2. This coding covers scars 1-27, 38-40, reverse side and scars 1-6, 13-30 obverse side.
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		light	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		straight with convex projections	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded	straight/ rounded	
5.2	Scar Termination at Distal Edge	feather/ step	mostly step some feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R14, C02169

	Prehistoric C02169 Scar R14	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart evenly dist.	+ 1	+ 1	+ 1
4.4	light	+ 25 - 75	+ 33.3 - 66.7	+ 40 - 60

5.1	rounded	+ 50 - 50	+ 33.3 - 66.7	+ 40 - 60
5.2	feather/step	+ 1	+ 50 - 50	+ 1
Total	+	+ 6.25	+ 7.2	+ 8.4
	-	- 3.75	- 2.8	- 1.6
%	+	+ 63	+ 72	+ 84
	-	- 37	- 28	- 16
Score		+ 26	+ 34	+ 60

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 60 - Mod./Sub. Percussion Thin Hammerstone

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02169, Edge Unit 2

	Prehistoric C02169 Edge Unit 2	AB6-13(a) Min. Shear Shape with P.F.	AB6-13(b) Mod. Shear Shape with P.F.	AB2-2(b) Min. Press. Rub with P.F.	AB14-16(b) Min. Perc. Shape with Hammerstone	AB13-18(b) Min. Perc. Shape with Billet
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 33.3 - 66.6	+ 1	+ 1	+ 1	+ 1
2.2	light	+ 16.7 - 83.3	- 1	- 1	- 1	- 1
2.3	heavy	+ 66.6 - 33.4	+ 1	+ 1	- 1	+ 80 - 20
2.4	straight with convex projections	+ 1	+ 1	+ 84 - 10	+ 33.3 - 66.7	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight/ rounded	+ 50 - 50	+ 44 - 56	+ 1	+ 33.3 - 66.6	+ 1
5.2	mostly step some feather	+ 50 - 50	+ 1	+ 1	+ 1	+ 1
Total	+	+ 4.2	+ 5.44	+ 5.84	+ 3.66	+ 5.8
	-	- 2.8	- 1.56	- 1.16	- 3.34	- 1.2
%	+	+ 60	+ 78	+ 83	+ 52	+ 83
	-	- 40	- 22	- 17	- 48	- 17
Score		+ 20	+ 56	+ 66	+ 4	+ 66

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 66 - Min. Press. Rub with P.F.

N.B.
Billet unit not selected as billet percussion work is not present elsewhere on specimen and the flakes removed are not shaping flakes.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02169	Main Flake Scar #R24/28	Edge Treatment on Same Scar	Notes
1.1	Scar Size	minimal		
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight & irregular		
5.2	Scar Termination at Distal Edge	feather & step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R24 to R28, C02169

	Prehistoric C02169 Scars R24-R28	AB9-5(b) Min. Press. Thin	AB5-9(a) Min. Perc. Thin Billet	AB16-7 Min. Perc. Thin Hammerstone
1.1	minimal	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 1	+ 1
3.2	gradual	+ 1	+ 1	+ 1
3.3	thin	+ 1	+ 88.9 - 11.1	+ 1
4.1	0	+ 77.8 - 22.2	+ 1	+ 1
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 1	+ 88.9 - 11.1	+ 1

5.1	straight & irregular	+ 1	+ 66 - 34	+ 50 - 50
5.2	feather and step	+ 1	+ 1	+ 1
Total	+	+ 7.778	+ 7.438	+ 7.5
	-	- .222	- .562	- .5
%	+	+ 97	+ 93	+ 94
	-	- 3	- 7	- 6
Score		+ 94	+ 86	+ 88

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 94 - Min. Pressure Thin with Pressure Flaker

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02169	Main Flake Scar # R35	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	minimal (2)	1. Shaping units have removed most of percussion bulb or bulb area was used as a platform for removal on other side.
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		0	
2.3	Microflakes		light	2. Edge Unit 1 (see scar 08 for details). Second coding of unit.
2.4	Proximal Edge Morphology		straight with convex proj.	
3.1	Negative Bulb of Force	n/a (1)		
3.2	Bulb to Scar Transition Angle	n/a		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	heavy		
5.1	Scar Shape at Distal Edge	rounded	straight and rounded	
5.2	Scar Termination at Distal Edge	feather	feather and step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R35, C02169

	Prehistoric C02169 Scar R35	AB7-10 Sub. Perc. Thin Billet	AB11-11 Very Sub. Indirect Perc.	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	- 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1				
3.2				
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	0	+ 50 - 50	+ 66.6 - 33.3	+ 20 - 80
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	heavy	- 1	- 1	- 1

5.1	rounded	+ 50 - 50	+ 33.3 - 66.6	+ 40 - 60
5.2	feather	+ 25 - 75	- 1	+ 40 - 60
Total	+	+ 2.75	+ 2.9	+ 2.8
	-	- 3.25	- 3.1	- 3.2
%	+	+ 46	+ 48.3	+ 47
	-	- 54	- 51.7	- 53
Score		- 8	- 3.4	- 6

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

All indeterminate - unable to identify, not enough codable attributes (only 6 out of 14 codable). illustrates the difficulty of coding partial scars and overlapped scars.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02169, Edge Unit 1

	Prehistoric C02169 Edge Unit 1	AB6-13(a) Min. Shear Shape with P.F.	AB6-13(b) Mod. Shear Shape with P.F.	AB2-2(b) Min. Press. Rub with P.F.	AB14-16(b) Min. Press. Shape with Hammerstone	AB15-18(b) Min. Perc. Shape/Billet
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 33.3 - 66.6	+ 1	+ 1	+ 16.7 - 83.3	+ 1
2.2	0	+ 83.3 - 16.7	- 1	- 1	- 1	- 1
2.3	light	+ 16.7 - 83.35	- 1	- 1	- 1	- 1
2.4	straight with convex projections	+ 1	+ 1	+ 84 - 16	83.3 - 16.6	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight and rounded	+ 50 - 50	+ 34 - 66	+ 1	+ 1	+ 1
5.2	feather and step	+ 50 - 50	+ 1	+ 1	+ 1	+ 1
Total	+	+ 4.33	+ 4.34	+ 4.84	+ 4	+ 5
	-	- 2.67	- 2.66	- 2.16	- 3	- 2
%	+	+ 62	+ 62	+ 69	+ 57	+ 71
	-	- 38	- 38	- 31	- 43	- 29
Score		+ 24	+ 24	+ 38	+ 14	+ 42

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

* Possible + 38 - Min. Press. Rub with P.F.

* selected unit, as this is the same as edge unit #1.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02169	Main Flake Scar # R37	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	(1)	1. No Edge Unit.
2.1	Edge Sharpness	sharp		
2.2	Margin Damage	0		
2.3	Microflakes	light		
2.4	Proximal Edge Morphology	flat curved notch		
3.1	Negative Bulb of Force	distinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	step/ feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R37, C02169

	Prehistoric C02169 Scar R37	AB7-10 Sub. Perc. Thin Billet	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB8-6 Sub. Pressure Thin with P.F.
1.1	substantial	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1
2.2	0	+ 50 - 50	+ 1	+ 50 - 50
2.3	light	- 1	+ 40 - 60	- 1
2.4	flat curved notch	+ 75 - 25	+ 1	- 1
3.1	distinct	+ 25 - 75	- 1	- 1
3,2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 80 - 20	+ 1
4.1	0	+ 50 - 50	+ 20 - 80	+ 50 - 50
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 75 - 25	+ 60 - 40	+ 75 - 25

5.1	rounded	+ 50 - 50	+ 40 - 60	+ 75 - 25
5.2	step/ feather	+ 1	+ 1	+ 1
Total	+	+ 7.5	+ 8.4	+ 7.5
	-	- 4.5	- 3.6	- 4.5
%	+	+ 63	+ 70	+ 63
	-	- 37	- 30	- 37
Score		+ 26	+ 40	+ 26

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 40 - Mod./Sub. Perc. Thin Hammerstone

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact, C02169

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
08			+ 50	Mod./Sub. Perc. Thin, Hammerstone	AB16-7(a)
	Edge Unit 1	Highly Probable	+ 82	Minimum Pressure Rub with P.F.	AB2-2(b)
024		Possible	+ 56	Moderate to Substantial Percussion Thin, Hammerstone	AB16-7(a)
027		n/a		scar not usable (attributes from two overlapping scars present)	n/a
R14		Possible	+ 60	Mod./Sub. Perc. Thin Hammerstone	AB16-7(a)
	Edge Unit 2	Possible	+ 66	Min. Press. Rub with P.F.	AB2-2(b)
R24 to R28		Highly Probable	+ 94	Min. Pressure Thin with Pressure Flaker	AB9-5(b)
R35		n/a	n/a	as only 6 of 14 attributes are codable, there are too few for scar identification	n/a
	Edge Unit 1	Possible	+ 38	Min. Pressure Rub with P.F.	AB2-2(b)
R37		Possible	+ 40	Mod./Sub. Perc. Thin with Hammerstone	AB16-7(a)

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units:

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Moderate and Substantial Percussion Thin with Hammerstone: This behavior unit resulted in face paring (biface thinning flakes) or substantial thinning of the artifact. Production Unit Code is 40:4, 51, 41.

3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

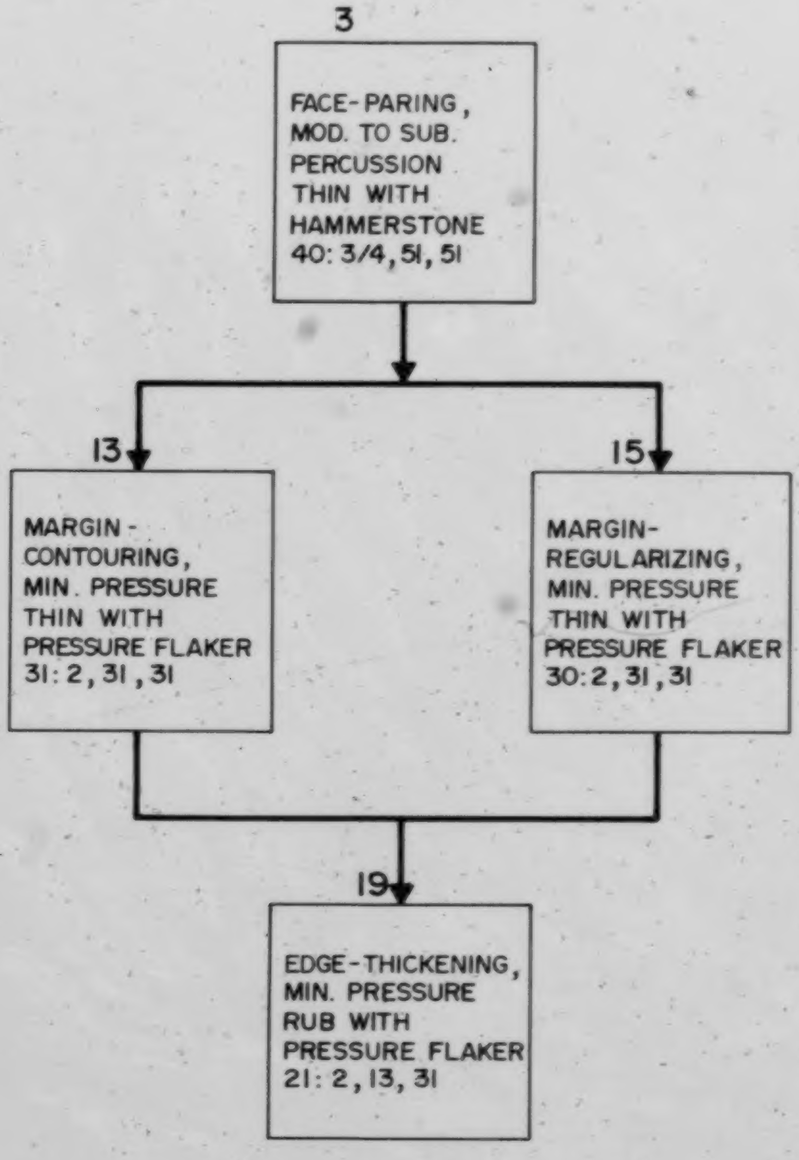
(a) Minimum Pressure Thinning with Pressure Flaker: This unit was identified for some small scars on the base (R24 to R28) and on the tip of the artifact. It was used for margin regularizing (removing inter-flake scar ridges) and margin contouring (increasing the edge angle to make a bifacial edge). Production Unit Code is 30/31:2, 31, 31.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

Only one edge unit is apparent from the analysis being a minimal pressure rub with a pressure flaker. This removes or blunts an overly thin edge to allow it to be used as a platform. Some "scalloped flakes," many with tiny platofrms, are removed from the artifact face at the same time (see experiment AB2-2(b) for size and type of flake removal). Production Unit Code is 21:2, 13, 31.

(b) Reconstructing Sequencing of Production Units: C02169

3.4 Flow Diagram of Production Units (below)


3
FACE-PARING, MOD. TO SUB. PERCUSSION THIN WITH HAMMERSTONE 40: 3/4, 51, 51
13
MARGIN-CONTOURING, MIN. PRESSURE THIN WITH PRESSURE FLAKER 31: 2, 31, 31
15
MARGIN-REGULARIZING, MIN. PRESSURE THIN WITH PRESSURE FLAKER 30: 2, 31, 31
19
EDGE-THICKENING, MIN. PRESSURE RUB WITH PRESSURE FLAKER 21: 2, 13, 31

3.5 Description and Discussion of Technological Grammar Found on Artifact

This biface was produced by use of moderate and substantial hammerstone thinning flakes. After the substantial thinning the edge was thickened and strengthened by applying the edge of a pressure flaker. This also removed some small thinning flakes. Margin contouring and margin regularizing was accomplished through the use of moderate pressure thinning flakes, especially at the base and tip of the specimen.

DdGw-2 —— CO 2169

OBVERSE FACE

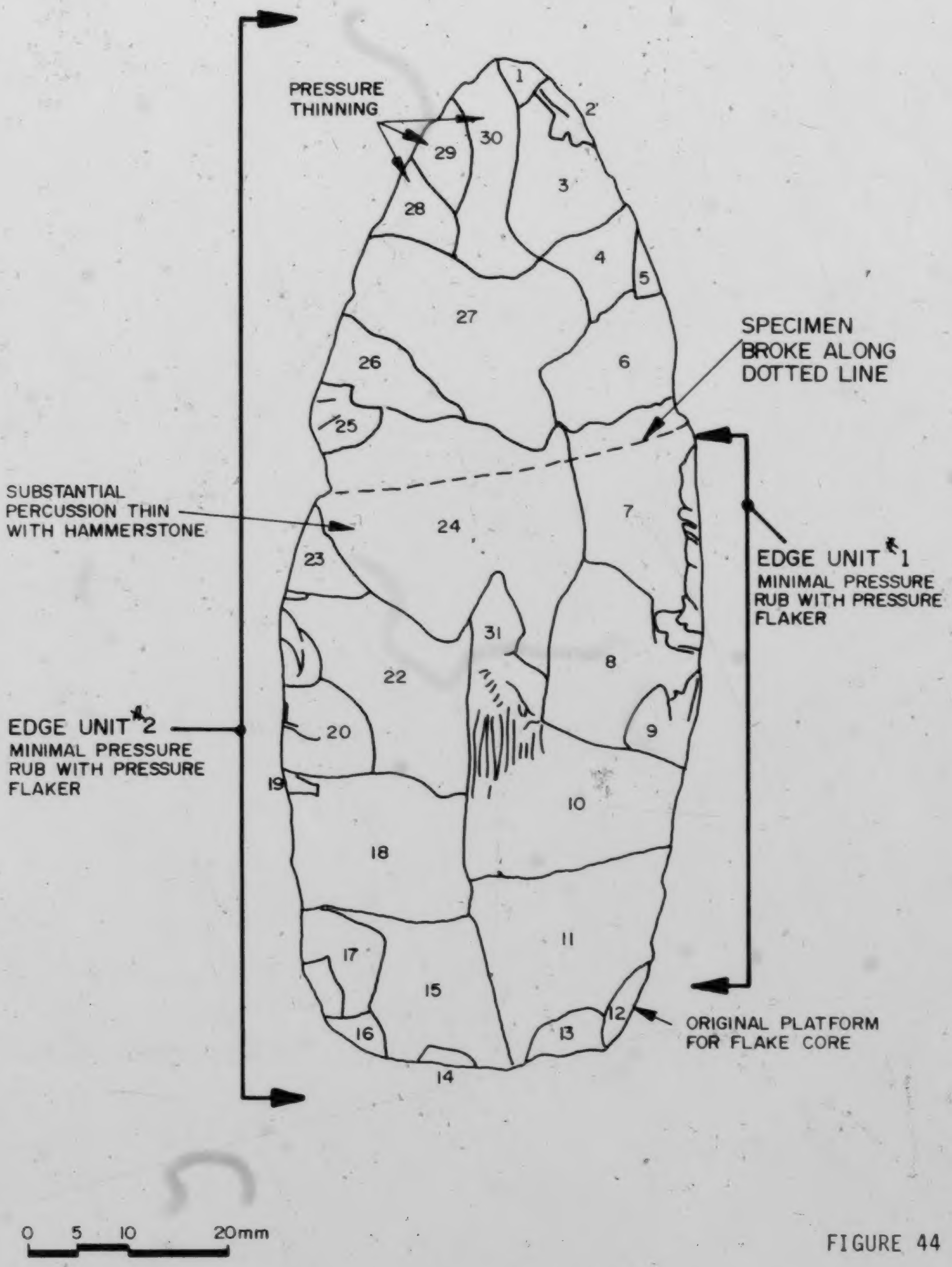
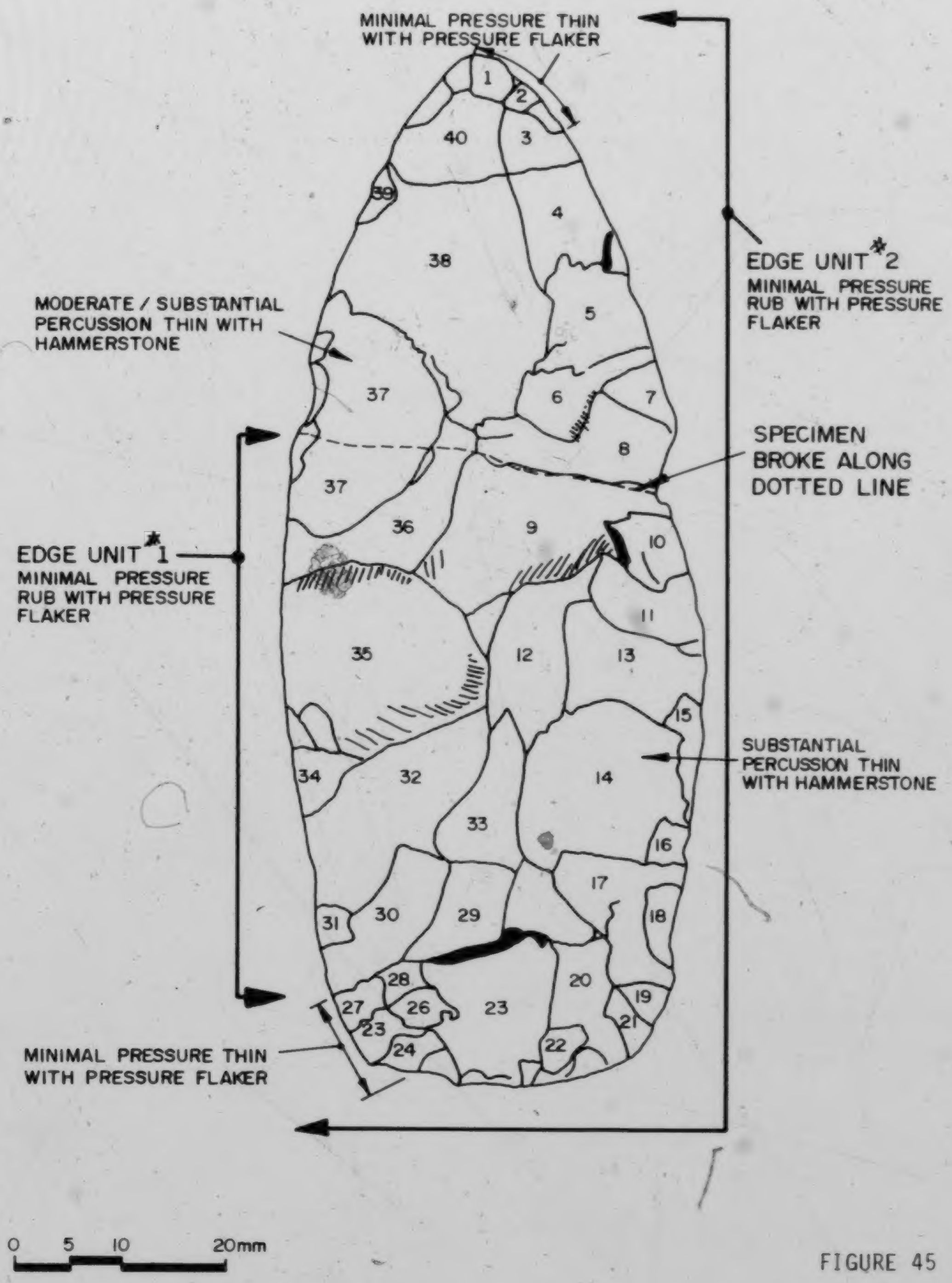

PRESSURE THINNING
1
2'
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
22
23
24
25
26
27
28
29
30
31
SPECIMEN BROKE ALONG DOTTED LINE
SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
EDGE UNIT #1
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
EDGE UNIT #2
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
ORIGINAL PLATFORM FOR FLAKE CORE
0 5 10 20mm

FIGURE 44

DdGw-2 — CO 2169

REVERSE FACE


MINIMAL PRESSURE THIN WITH PRESSURE FLAKER
EDGE UNIT *2
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
MODERATE / SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
SPECIMEN BROKE ALONG DOTTED LINE
EDGE UNIT *1
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
MINIMAL PRESSURE THIN WITH PRESSURE FLAKER
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
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20
21
22
23
24
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
0
5
10
20mm

FIGURE 45

Plate 54: Prehistoric Artifact C02169, Obverse Face.

Plate 55: Prehistoric Artifact C02169, Reverse Face.

Table 65: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: DdGw-2

1.3 Specimen Catalogue #: C02357

1.4 Photographic Plate Identification: Roll 3, B3, #13
Roll 4, B4, #9

1.5 Standard Artifact Description:

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: Biface

1.8 Flaking (Bifacial/Unifacial):

1.9 Metric Size: length - 10.78 cm
width - 3.66 cm
thickness - 1.30 cm

1.10 Form/Morphology Description:

This artifact represents a biface manufactured from a flake core. One side of the specimen has extensive step fracturing, while the other side is unretouched, original flake core surface.

The base is slightly rounded (convex) and has numerous thinning flakes.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02537	Main Flake Scar # 04	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	minimal (1) to moderate	1. Edge Unit 1 - there is extensive edge treatment on one lateral edge of this specimen. The other has none as the notches from percussion flaking are still present and there are many convex projections between scars. 2. Platform intact for coding. 3. Has been truncated by another scar.
2.1	Edge Sharpness	sharp (2)	predominantly sharp	
2.2	Margin Damage	0	heavy	
2.3	Microflakes	0	light	
2.4	Proximal Edge Morphology	flat curved notch	shallow curved notches	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	0		
4.3	Rib Spacing And Distribution	0		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	n/a (3)	straight & irregular	
5.2	Scar Termination at Distal Edge	n/a	feather and step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 04, C02537

	Prehistoric C02537 Scar 04	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.	AB16-17(a) Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1
2.2	absent	+ 50 - 50	+ 66.7 - 33.3	+ 1
2.3	0	+ 1	+ 33.3 - 66.7	+ 60 - 40
2.4	flat curved notch	+ 75 - 25	+ 1	+ 1
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	0	+ 50 - 50	+ 66.7 - 33.3	+ 20 - 80
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 75 - 25	+ 66.7 - 33.3	+ 60 - 40

5.1		n/a	n/a	n/a	n/a
5.2		n/a	n/a	n/a	n/a
Total	+		+ 7.5	+ 7.67	+ 8.2
	-		- 2.5	- 2.33	- 1.8
%	+		+ 75	+ 86	+ 82
	-		- 25	- 20	- 18
Score			+ 50	+ 60	+ 64

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 64 Mod./Sub. Perc. Thin Hammerstone

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02537, Edge Unit 1 (Scar 04 form)

	Prehistoric C02537 Edge Unit 1	AB2-2(b) Min. Press. Rub P.F.	AB6-13(b) Mod./Sub. Shear Shape P.F.	AB16-7(b) Min. Perc. Thin Hammerstone	AB5-9(a) Min. Perc. Thin Billet	AB15-18(a) Mod. Perc. Shape Billet
1.1	minimal to mod.	+ 1	+ 1	+ 1	+ 1	- 1
2.1	predominantly sharp	+ 1	+ 1	+ 1	+ 1	+ 1
2.2	heavy	+ 1	+ 1	+ 66 - 34	+ 1	+ 42.86 - 57.15
2.3	light	- 1	- 1	- 1	- 1	+ 28.6 - 71.4
2.4	follows existing edge	+ 1	+ 1	+ 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight & irregular	+ 50 - 50	+ 1	+ 50 - 50	+ 66 - 34	+ 57.1 - 42.9
5.2	feather & step	+ 1	+ [illegible]	+ 1	+ 1	+ 1
Total	+	+ 5.5	+ 6	+ 5.2	+ 5.6	+ 4.3
	-	- 1.5	- 1	- 1.8	- 1.4	- 2.7
%	+	+ 79	+ 86	+ 74	+ 80	+ 61
	-	- 21	- 14	- 26	- 20	- 39
Score		+ 58	+ 72	+ 48	+ 60	+ 22

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 72 - Mod./Substantial Shear Shape with Pressure Flaker

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02537	Main Flake Scar # 018	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. Coded on scar 04.
2.1	Edge Sharpness	sharp (2)		2. Platform intact enough for coding.
2.2	Margin Damage	0		
2.3	Microflakes	light		
2.4	Proximal Edge Morphology	flat curved notch		
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 018, C02537

	Prehistoric C02537 Scar 018	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(a) Mod. Perc. Thin Billet	AB8-6 Sub. Press. Thin with P.F.
1.1	moderate	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1
2.2	0	+ 1	+ 60 - 40	+ 50 - 50
2.3	light	+ 40 - 60	+ 40 - 60	- 1
2.4	flat curved notch	+ 1	+ 1	- 1
3.1	indistinct	+ 1	+ 80 - 20	+ 1
3.2	gradual	+ 1	+ 80 - 20	+ 1
3.3	thin	+ 80 - 20	+ 80 - 20	+ 1
4.1	present	+ 80 - 20	+ 20 - 80	+ 50 - 50
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart evenly dist.	+ 1	- 1	- 1
4.4	0	+ 60 - 40	+ 80 - 20	+ 75 - 25

5.1	rounded	+ 40 - 60	+ 40 - 60	+ 75 - 25
5.2	step	+ 60 - 40	+ 50 - 50	+ 25 - 75
Total	+	+ 11.6	+ 9.3	+ 8.75
	-	- 2.4	- 4.7	- 5.25
%	+	+ 83	+ 66	+ 63
	-	- 17	- 34	- 37
Score		+ 66	+ 34	+ 26

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 66 - Mod./Sub. Perc. Thin Hammerstone

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02537	Main Flake Scar # R8	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. See scar 04
2.1	Edge Sharpness	sharp		
2.2	Margin Damage	0		
2.3	Microflakes	0		
2.4	Proximal Edge Morphology	flat curved notch		
3.1	Negative Bulb of Force	very indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R8, C02537

	Prehistoric C02537 Scar R8	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet	AB8-6 Sub. Press. Thin P.F.
1.1	moderate	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1
2.2	0	+ 1	+ 40 - 60	+ 50 - 50
2.3	0	+ 60 - 40	+ 60 - 40	+ 1
2.4	flat curved notch	+ 1	+ 1	- 1
3.1	very indistinct	+ 1	+ 80 - 20	+ 1
3.2	gradual	+ 1	+ 80 - 20	+ 1
3.3	thin	+ 80 - 20	+ 80 - 20	+ 1
4.1	0	+ 20 - 80	+ 80 - 20	+ 50 - 50
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 60 - 40	+ 80 - 20	+ 75 - 25

5.1	straight	+ 60 - 40	+ 60 - 40	+ 25 - 75
5.2	step	+ 60 - 40	+ 50 - 50	+ 25 - 75
Total	+	+ 9.4	+ 9.1	+ 8.25
	-	- 2.6	- 2.9	- 3.75
%	+	+ 78	+ 76	+ 69
	-	- 22	- 24	- 31
Score		+ 56	+ 52	+ 38

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 56 - Mod./Sub. Perc. Thin Hammerstone

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

Artifact # C02537	Main Flake Scar # R10	Edge Treatment on Same Scar	Notes
1.1 Scar Size	substantial	(1)	1. See scar 04
2.1 Edge Sharpness	sharp		
2.2 Margin Damage	light		
2.3 Microflakes	0		
2.4 Proximal Edge Morphology	flat curved notch		
3.1 Negative Bulb of Force	indistinct		
3.2 Bulb to Scar Transition Angle	gradual		
3.3 Flake Thickness	thin		
4.1 Presence or Absence of Ribs	0		
4.2 Distinctiveness of Ribs	n/a		
4.3 Rib Spacing And Distribution	n/a		
4.4 Tearing	0		
5.1 Scar Shape at Distal Edge	straight		
5.2 Scar Termination at Distal Edge	step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R10

	Prehistoric C02537 Scar R10	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.	AB16-17(a) Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1
2.2	light	+ 50 - 50	+ 33.3 - 66.7	- 1
2.3	0	+ 1	+ 33.3 - 66.7	+ 60 - 40
2.4	flat curved notch	+ 75 - 25	+ 1	+ 1
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	0	+ 50 - 50	+ 66.7 - 33.3	+ 20 - 80
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 75 - 25	+ 66.7 - 33.3	+ 60 - 40

5.1	straight	- 1	- 1	+ 60 - 40
5.2	step	+ 75 - 25	- 1	+ 60 - 40
Total	+	+ 8.25	+ 7.67	+ 8.4
	-	- 3.75	- 4.33	- 3.6
%	+	+ 69	+ 64	+ 70
	-	- 31	- 36	- 30
Score		+ 38	+ 28	+ 40

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 40 - Mod./Sub. Perc. Thin Hammerstone

The absence of any distinct percussion bulb and the flatness of the flake also support a hammerstone identification.

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact, C02357 (Jessup)

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
04		Possible	+ 64	Mod./Sub. Perc. Thin Hammerstone	AB16-7(a)
	Edge Unit # 1	Highly Probable	+ 72	Moderate/Substantial Shear Shape with Pressure Flaker	AB6-13(b)
018		Possible	+ 66	Mod./Sub. Perc. Thin Hammerstone	AB16-7(a)
R8		Possible	+ 56	Mod./Sub. Perc. Thin Hammerstone	AB16-7(a)
R10		Possible	+ 40	Mod./Sub. Perc. Thin Hammerstone	AB16-7(a)

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units:

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Moderate and Substantial Percussion Thin with Hammerstone: Percussion thinning removes face paring flakes which are at least two times longer than the platform at the artifact edge, thinning the specimen much faster than the contour or outline shape is altered. Production Unit Codes for these behavior units are substantial - 40:4, 41, 41; moderate - 40:3, 41, 41.

(b) Because this specimen is made from a flake, another function of the hammerstone thinning was to contour the margin by removing thin flakes near the margin to increase the edge angle and produce a bifacial edge. Production Unit Code is 31:3/4, 41, 41.

3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

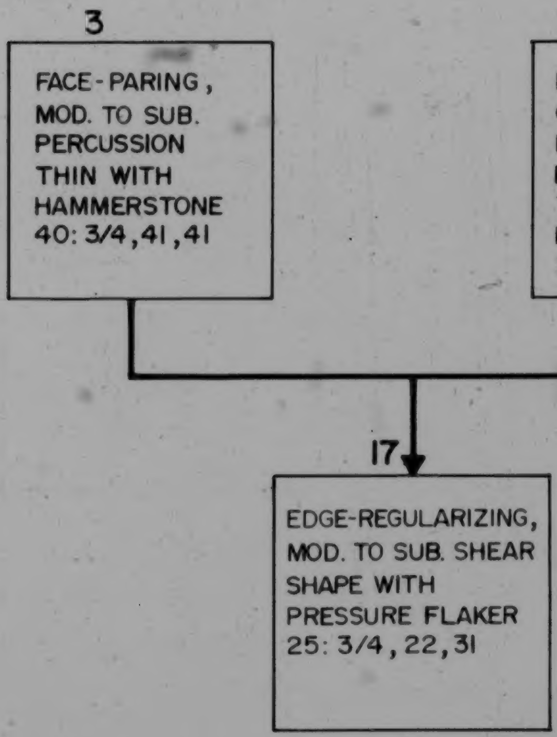
There are no pressure flake scars on the specimen although some flakes look like pressure. These appear to be multiple flake removals from a single blow (as discerned from the platform size and position). Their thinness and small size makes them resemble minimum pressure flakes.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

Only one edge unit (unit #1) was identified as moderate to substantial shear shaping with the side and tip of a pressure flaker. Shearing which involves placing the side of the pressure flaker against the edge and moving it diagonally (or in some cases perpendicularly) along the edge producing an irregular surface topography of overlapping scars and platforms in which individual scar outlines are obscure. This production unit serves to center, straighten and regularize the edge all in one operation. Production Unit Code is 23/24/25:3/4, 22, 31.

(b) Reconstructing Sequencing of Production Units: C02357

3.4 Flow Diagram of Production Units (below)

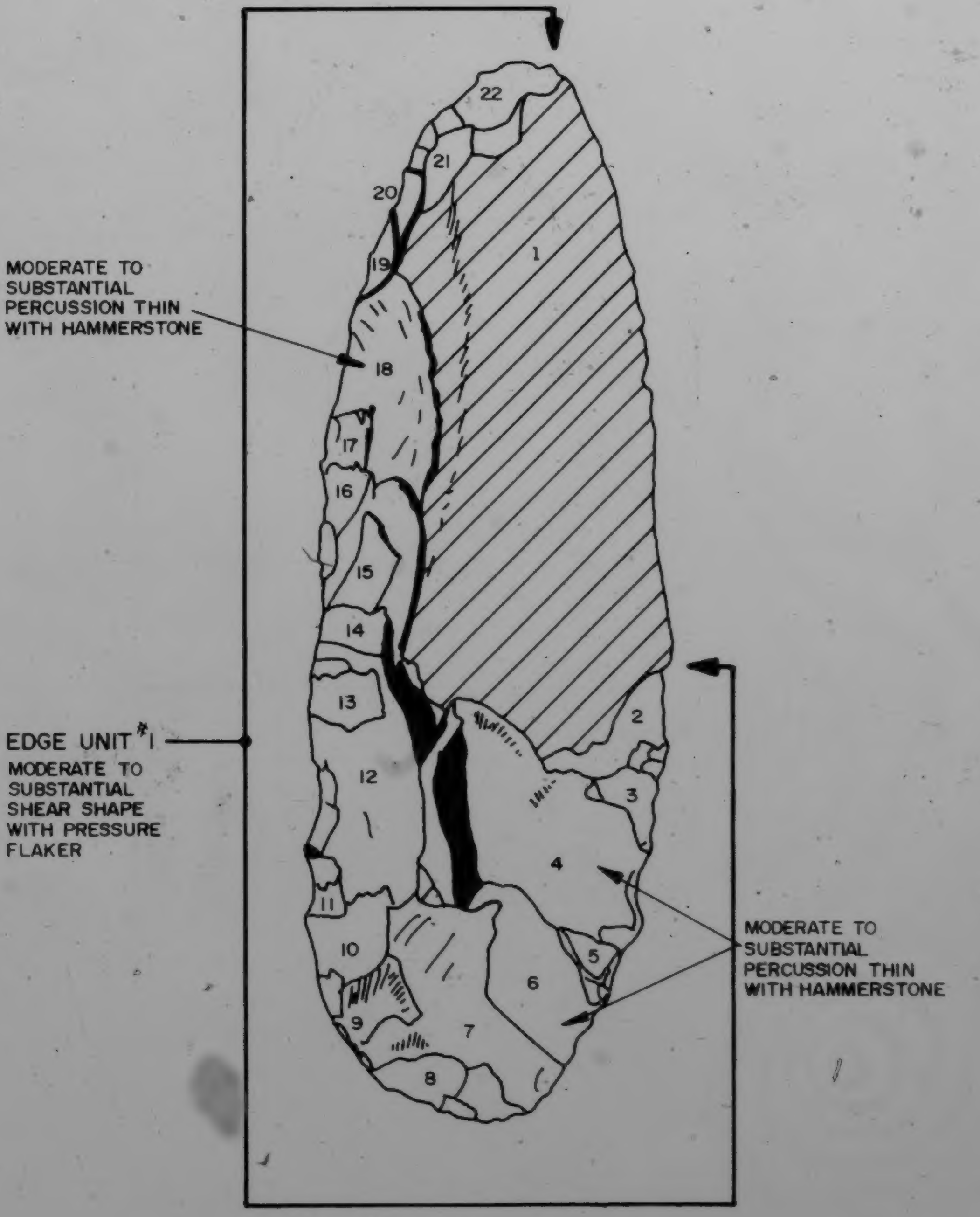

3
FACE-PARING, MOD. TO SUB. PERCUSSION THIN WITH HAMMERSTONE 40: 3/4, 41, 41
7
MARGIN-CONTOURING, MOD. TO SUB. PERCUSSION THIN WITH HAMMERSTONE 31: 3/4, 41, 41
17
EDGE-REGULARIZING, MOD. TO SUB. SHEAR SHAPE WITH PRESSURE FLAKER 25: 3/4, 22, 31

3.5 Description and Discussion of Technological Grammar Found on Artifact

This biface preform is manufactured from a large flake core substantial remnants of which remain on both the obverse (scar O1) and reverse faces (scar R20). The bifacial edge on the flake core was produced by moderate and substantial percussion thinning with a hammerstone which also contoured the margin. Subsequently, the side of an antler pressure flaker was used to shear shape the edge and resulted in centering, straightening and regularizing the margin. Some flakes were also removed during this process [as demonstrated in Experiment AB6-13(b)]. This has regularized or straightened the margin by slightly smoothing over some of the flat curved notches left from the percussion flaking.

DdGw-2 —— CO 2357

OBVERSE FACE


22
21
20
19
1
18
17
16
15
14
13
12
2
3
4
11
10
5
6
9
7
8
MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
EDGE UNIT # 1
MODERATE TO SUBSTANTIAL SHEAR SHAPE WITH PRESSURE FLAKER
MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE

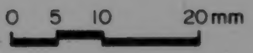


FIGURE 46

DdGw-2 —— CO 2357

REVERSE FACE

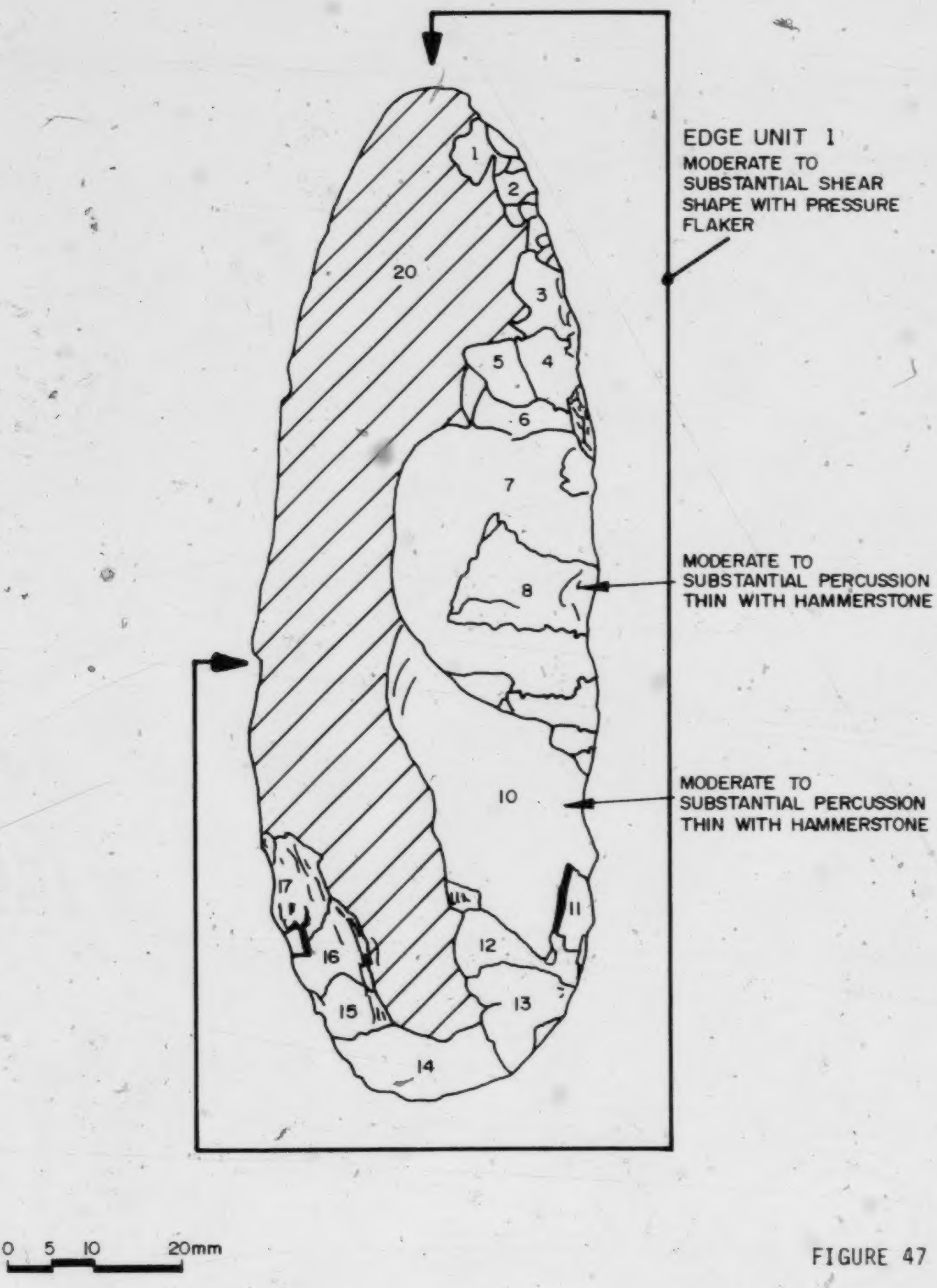

EDGE UNIT 1
MODERATE TO SUBSTANTIAL SHEAR SHAPE WITH PRESSURE FLAKER
MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
1
2
3
4
5
6
7
8
10
11
12
13
14
15
16
17
20
0
5
10
20mm

FIGURE 47

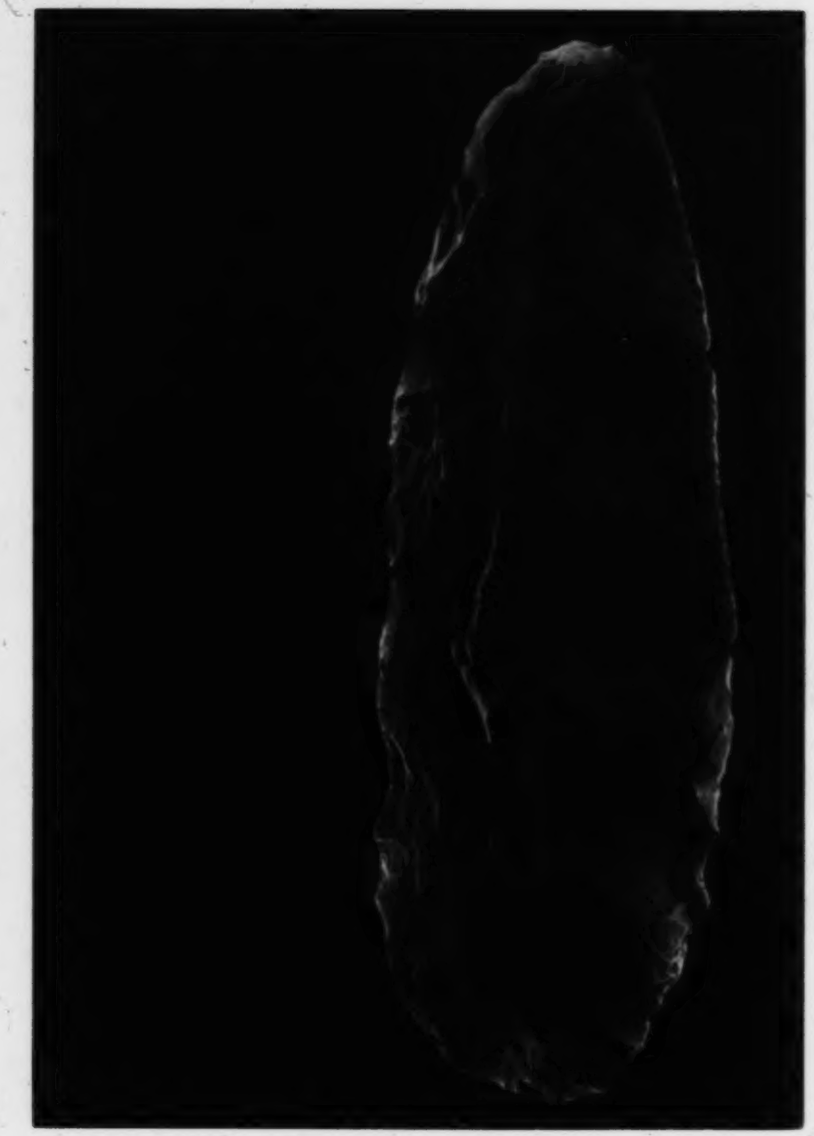


Plate 56. Prehistoric Artifact, C02357, Obverse Face.

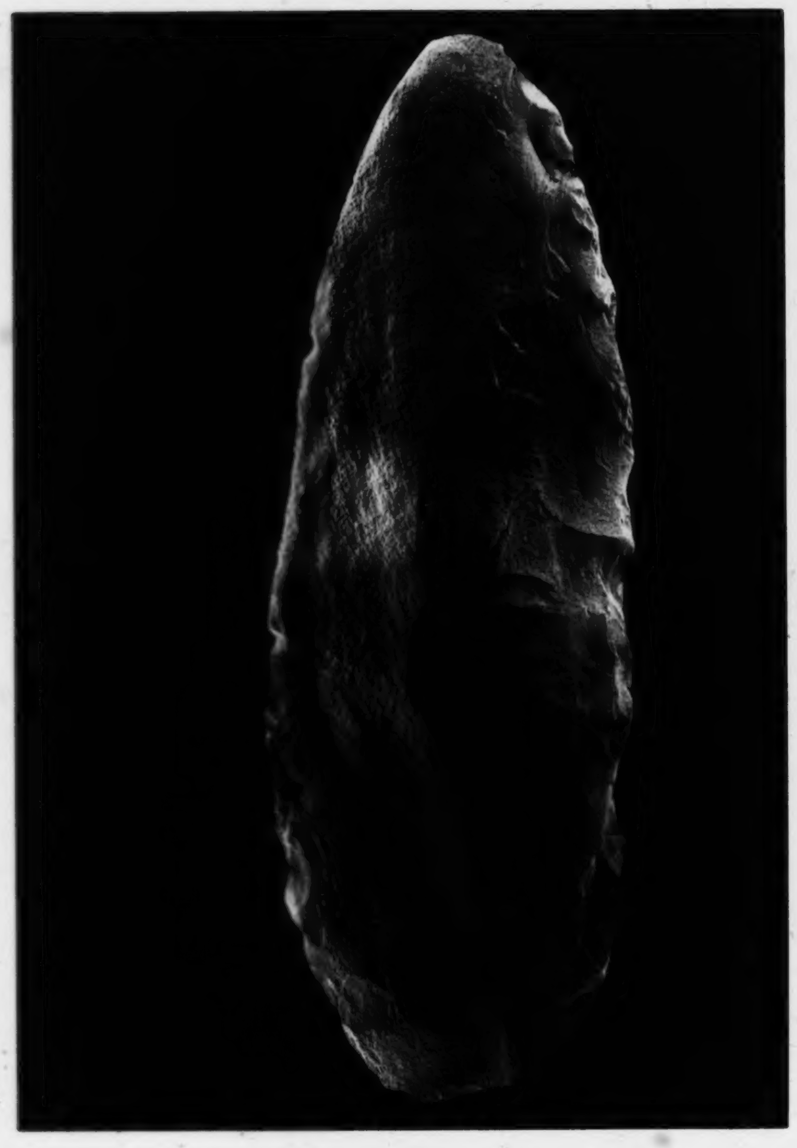


Plate 57. Prehistoric Artifact, C02357, Reverse Face.

Table 66: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: DdGw-2 (Jessup)

1.3 Specimen Catalogue #: C02135

1.4 Photographic Plate Identification: Roll 3, B3, #5
Roll 4, B4, #1

1.5 Standard Artifact Description:

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: Pointed Biface

1.8 Flaking (Bifacial/Unifacial): Bifacial

1.9 Metric Size: length - 10.28 cm
width - 3.50 cm
thickness - 1.72 cm

1.10 Form/Morphology Description:

This artifact consists of a bi-pointed bifacial preform that was abandoned prior to the final thinning process. Such specimens are common at the Jessup Quarry site and could be considered rejects from the production process. This one has been analyzed in order to determine the production units in use at the site just prior to final biface completion. The reason for the loss of the specimen by aboriginal knappers is the large hump of material left on the reverse face. In attempting to remove this central mass, the biface broke bilaterally and was abandoned.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02135	Main Flake Scar # 05	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial		1. The tearing present in one spot is due to a flaw in the raw material and has not been included in the coding.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	far apart on distal 1/2		
4.4	Tearing	0 (1)		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02135, Scar 05, Main Scar

	Prehistoric C02135 Scar 05	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet	AB7-10 Sub. Perc. Thin Billet
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 80 - 20	+ 75 - 25
3.2	gradual	+ 1	+ 80 - 20	+ 75 - 25
3.3	thin	+ 80 - 20	+ 80 - 20	+ 50 - 50
4.1	present	+ 80 - 20	+ 20 - 80	+ 50 - 50
4.2	indistinct	+ 1	+ 1	+ 1
4.3	far apart on distal 1/2	- 1	+ 1	+ 1
4.4	0	+ 60 - 40	+ 80 - 20	+ 75 - 25

5.1	rounded	+ 40 - 60	+ 40 - 60	+ 50 - 50
5.2	feather	+ 40 - 60	+ 50 - 50	+ 25 - 75
Total	+	+ 6.8	+ 7.3	+ 7.0
	-	- 3.2	- 2.7	- 3.0
%	+	+ 68	+ 73	+ 70
	-	- 32	- 27	- 30
Score		+ 36	+ 46	+ 40

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 46 - Mod./Sub. Percussion Thin Billet

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02135	Main Flake Scar # 012	Edge Treatment on Same Scar	Notes
1.1	Scar Size	mod. to sub. (2)	very minimal (1)	1. Edge Unit #2 scars 8-26, reverse face scars 6-26 (see scar R6).
2.1	Edge Sharpness	sharp	sharp	
2.2	Margin Damage	0	0	2. There is no specific edge treatment on scar 012 itself.
2.3	Microflakes	0	light	
2.4	Proximal Edge Morphology	flat curved notch	straight (3)	3. Some remnants of poss. flat curved notches from percussion flaking and remnants of U-shaped pressure notches remain along with convex projections.
3.1	Negative Bulb of Force	distinct		
3.2	Bulb to Scar Transition Angle	steep		
3.3	Flake Thickness	thick (2.5 mm)		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart and evenly dist.		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded	straight/ irregular	
5.2	Scar Termination at Distal Edge	feather	feather & step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 012, C02135

	Prehistoric C02135 Scar 012	AB7-10 Sub. Perc. Thin Billet	AB5-9 Mod. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB12-19 Sub. Perc. Shape Billet
1.1	mod./sub. (code sub.)	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 1	+ 1
2.2	0	+ 50 - 50	+ 40 - 60	+ 66.6 - 33.3	+ 1	- 1
2.3	0	+ 1	+ 60 - 40	+ 33.3 - 66.7	+ 60 - 40	+ 1
2.4	flat curved notch	+ 75 - 25	+ 1	+ 1	+ 1	+ 1
3.1	distinct	+ 25 - 75	+ 20 - 80	+ 33.3 - 66.7	- 1	- 1
3.2	steep	+ 25 - 75	+ 20 - 80	- 1	- 1	- 1
3.3	thick	+ 50 - 50	+ 20 - 80	- 1	+ 20 - 80	+ 25 - 75
4.1	present	+ 50 - 50	+ 20 - 80	+ 33.3 - 66.7	+ 80 - 20	+ 25 - 75
4.2	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
4.3	rel. far apart on dist. 1/2	+ 1	+ 1	+ 1	+ 1	+ 1
4.4	0	+ 75 - 25	+ 80 - 20	+ 66.6 - 33.3	+ 60 - 40	+ 75 - 25

5.1		rounded	+ 50 - 50	+ 40 - 60	+ 33.3 - 66.7	+ 40 - 60	+ 25 - 75
5.2		feather	+ 25 - 75	+ 50 - 50	+ 1	+ 40 - 60	+ 1
Total	+		+ 9.25	+ 8.5	+ 8.67	+ 8	+ 8.5
	-		- 4.75	- 5.5	- 5.33	- 6	- 5.5
%	+		+ 66.07	+ 60.71	+ 62	+ 57	+ 60.71
	-		- 33.93	- 39.28	- 38	- 43	- 39.28
Score			+ 32.14	+ 21.53	+ 24	+ 14	+ 2.53

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 32 - Sub. Perc. Thin Billet

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02135, Edge Unit #2

	Prehistoric C02135 Edge Unit #2	AB6-13(a) Min. Shear Shape with P.F.	AB6-13(b) Mod. Shear Shape with P.F.	AB2-2(a) Min. Platform Isolating P.F.	AB16-7(b) Min. Perc. Thin Hammerstone	AB9-5(a) Min. Perc. Thin Billet
1.1	very minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 33.3 - 66.7	+ 1	+ 1	+ 1	+ 1
2.2	0	+ 83.3 - 16.7	- 1	+ 14.28 - 85.72	+ 34 - 66	- 1
2.3	light	- 1	- 1	+ 42.85 - 57.15	- 1	- 1
2.4	straight	+ 1	+ 1	- 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight/ irregular	+ 1	+ 1	+ 85 - 15	+ 50 - 50	+ 66 - 34
5.2	feather/ step	+ 1	+ 1	+ 1	+ 1	+ 1
Total	+	+ 5.17	+ 5	+ 4.42	+ 4.84	+ 4.66
	-	- 1.83	- 2	- 2.58	- 2.16	- 2.34
%	+	+ 74	+ 71	+ 63	+ 69	+ 67
	-	- 26	- 29	- 37	- 31	- 33
Score		+ 48	+ 42	+ 26	+ 38	+ 34

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 48 - Min. Shear Shape P.F.

N.B. Unit is not extensive and only sparingly applied.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02135	Main Flake Scar # 023	Edge Treatment on Same Scar	Notes
1.1	Scar Size	mod.	(1)	1. See scar #012 for edge unit.
2.1	Edge Sharpness			2. Removed by edge treatment or more likely was used as a platform for percussion flaking.
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	n/a (2)		
3.2	Bulb to Scar Transition Angle	n/a		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. close together & on distal 1/2		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight and rounded		
5.2	Scar Termination at Distal Edge	feather/ step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 023, C02135

	Prehistoric C02135 Scar 023	AB8-6 Sub. Press. Thin with P.F.	AB9-5(a) Mod. Press. Thin with P.F.	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet
1.1	moderate	+ 1	+ 67 - 33	+ 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	n/a	n/a	n/a	n/a	n/a
3.2	n/a	n/a	n/a	n/a	n/a
3.3	thin	+ 1	+ 1	+ 80 - 20	+ 80 - 20
4.1	present	+ 50 - 50	+ 22.2 - 77.8	+ 80 - 20	+ 20 - 80
4.2	indistinct	+ 1	+ 1	+ 1	+ 1
4.3	rel. close together on distal 1/2	+ 1	+ 1	- 1	- 1
4.4	0	+ 75 - 25	+ 1	+ 60 - 40	+ 80 - 20

5.1	straight & rounded	+ 1	+ 66.7 - 33.3	+ 1	+ 1
5.2	feather/ step	+ 1	+ 1	+ 1	+ 1
Total	+	+ 7.25	+ 6.56	+ 6.20	+ 5.80
	-	- .75	- 1.44	- 1.80	- 2.20
%	+	+ 91	+ 82	+ 78	+ 73
	-	- 9	- 18	- 22	- 27
Score		+ 82	+ 64	+ 56	+ 46

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 82 - Sub. Press. Thin with P.F.

N.B. This flake has an unusual platform/percussion bulb area and may be only a scar remnant.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02135	Main Flake Scar # n/a	Edge Treatment on Same Scar	Notes
1.1	Scar Size	(1) Edge Unit 1(a) minimal	(2) Edge Unit 1(b)	1. Edge Unit 1(a) comprises the larger scars 01 to 04 and 027 to 031 plus R1 to 4 and R27 to R32.
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		0	
2.3	Microflakes		heavy	2. Edge Unit 1(b) consists of a very minimal treatment on the edge of the above scars.
2.4	Proximal Edge Morphology		straight	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. close together on distal 1/2		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight & irregular	straight/ irregular	
5.2	Scar Termination at Distal Edge	feather and step	feather and step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, Edge Unit 1(a) (a group of minimal scars has been coded together) C02135

	Prehistoric C02135 Edge Unit 1(a)	AB16-7(b) Minimal Perc. Thin Hammerston	AB30-17 Mod. Perc. Shape Hammer.	AB9-5(b) Min. Press. Thin with P.F.	AB13-15 Min. Press. Shape with P.F.	AB5-9(a) Min. Perc. Thin Billet
1.1	minimal	+ 1	+ 66.6 - 33.3	+ 1	+ 1	+ 77.8 - 22.2
2.1						
2.2						
2.3						
2.4						
3.1	indistinct	+ 1	+ 1	+ 1	- 1	+ 1
3.2	gradual	+ 1	+ 1	+ 1	- 1	+ 1
3.3	thin	+ 1	+ 1	+ 1	- 1	+ 88.9 - 11.1
4.1	present	- 1	+ 33.3 - 66.7	+ 25 - 75	- 1	- 1
4.2	indistinct	n/a	+ 1	+ 1	n/a	n/a
4.3	rel. close together on distal 1/2	n/a	- 1	+ 1	n/a	n/a
4.4	0	+ 1	+ 66.7 - 33.7	+ 1	+ 1	+ 88.9 - 11.1

5.1	straight and irregular	+ 50 - 50	+ 50 - 50	+ 1	+ 50 - 50	+ 66 - 34
5.2	feather & step	+ 1	+ 1	+ 1	+ 1	+ 1
Total	+	+ 6.5	+ 7.17	+ 9.25	+ 3.5	+ 6.22
	-	- 1.5	- 2.83	- .75	- 4.5	- 1.78
%	+	+ 81	+ 72	+ 93	+ 44	+ 78
	-	- 19	- 28	- 7	- 56	- 22
Score		+ 62	+ 44	+ 86	- 12	+ 56

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 86 - Min. Press. Thin with P.F.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02135, Edge Unit # 1(b)

	Prehistoric C02135 Edge Unit 1	AB6-13(a) Min. Shear Shape with P.F.	AB6-13(b) Mod. Shear Shape with P.F.	AB2-2(b) Min. Press. Rub with P.F.
1.1	very minimal	+ 1	+ 1	+ 1
2.1	sharp to intermediate	+ 1	+ 50 - 50	+ 50 - 50
2.2	0	+ 83.3-16.7	- 1	- 1
2.3	heavy	+ 66.7 - 33.3	+ 1	+ 1
2.4	straight	+ 1	+ 1	+ 84 - 16
3.1				
3.2				
3.3				
4.1				
4.2				
4.3				
4.4				

5.1	straight/ irregular	+ 1	+ 1	+ 50 - .50
5.2	feather/ step	+ 1	+ 1	+ 1
Total	+	+ 6.5	+ 5.5	+ 4.84
	-	- .5	- 1.5	- 2.16
%	+	+ 93	+ 79	+ 69
	-	- 7	- 21	- 31
Score		+ 86	+ 58	+ 38

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 86 - Min. Shear Shape with P.F.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02135	Main Flake Scar # R6	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very substantial	(1)	1. Edge Unit 2 - Scars 6-26, obverse face, scars 8-26 (see scar 012).
2.1	Edge Sharpness			
2.2	Margin Damage			2. Some remnants of poss. flat curved notches from percussion flaking and U-shaped notches from pressure flaking remain.
2.3	Microflakes			
2.4	Proximal Edge Morphology	(2)		
3.1	Negative Bulb of Force	indistinct		3. The tearing is due to a flaw in the raw lithic material and has not been included in the coding.
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on distal 1/2		
4.4	Tearing	0 (3)		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R6, Main Scar, C02135

	Prehistoric C02135 Scar R6	AB7-10 Sub. Perc. Thin Billet	AB5-9(a) Mod. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	very substantial	+ 1	+ 1	- 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 75 - 25	+ 80 - 20	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 80 - 20	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 80 - 20	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 20 - 80	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	+ 1	+ 1	+ 1	- 1
4.4	0	+ 75 - 25	+ 80 - 20	+ 66.6 - 33.3	+ 60 - 40

5.1	rounded	+ 50 - 50	+ 40 - 60	+ 33.3 - 66.7	+ 40 - 60
5.2	feather	+ 25 - 75	+ 50 - 50	+ 1	+ 40 - 60
Total	+	+ 7.0	+ 7.3	+ 7.0	+ 7.0
	-	- 3.0	- 2.7	- 3.0	- 3.0
%	+	+ 10	+ 73	+ 70	+ 70
	-	- 30	- 27	- 30	- 30
Score		+ 40	+ 46	+ 40	+ 40

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 46 - Mod./Sub. Perc. Thin Billet

The coding is very close on this particular scar. Based on the rib distribution pattern and size, it has been identified as mod./sub. billet percussion thinning.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02135	Main Flake Scar # R12	Edge Treatment on Same Scar	Notes
1.1	Scar Size	sub.		
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. close together on distal 1/2		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	mostly rounded some straight		
5.2	Scar Termination at Distal Edge	step and feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R12, C02135

	Prehistoric C02135 Scar R12	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB8-6 Sub. Press. Thin with P.F.	AB12-19 Sub. Perc. Shape Billet	AB14-16(a) Sub. Perc. Shape Hammerstone
1.1	mod. to sub.	+ 1	+ 1	+ 1	+ 1	+ 1
2.1						
2.2						
2.3						
2.4						
3.1	indistinct	+ 1	+ 75 - 25	+ 1	+ 1	+ 1
3.2	gradual	+ 1	+ 75 - 25	+ 1	+ 1	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1	+ 75 - 25	+ 1
4.1	present	+ 80 - 20	+ 50 - 50	+ 50 - 50	+ 25 - 75	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
4.3	rel. close on distal 1/2	- 1	- 1	+ 1	- 1	- 1
4.4	0	+ 60 - 40	+ 75 - 25	+ 75 - 25	+ 75 - 25	+ 66.7 - 33.3

5.1	mostly rounded some straight	+ 1	+ 50 - 50	+ 1	+ 1	+ 33.3 - 66.7
5.2	step and feather	+ 1	+ 1	+ 1	+ 50 - 50	+ 1
Total	+	+ 8.20	+ 6.75	+ 9.25	+ 7.25	+ 7.33
	-	- 1.80	- 3.25	- .75	- 2.75	- 2.67
%	+	+ 82	+ 68	+ 93	+ 73	+ 73
	-	- 18	- 32	- 7	- 27	- 27
Score		+ 64	+ 36	+ 86	+ 46	+ 46

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 86 - Sub. Press. Thin with P.F.

N.B.

The pressure flaking appears to be superimposed over an earlier and much larger, possibly billet percussion thin scar.

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact C02135

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
05		Possible	+ 46	Mod./Sub. Perc. Thin Billet	AB5-9(b) and AB7-10
012		Indeterminate	+ 32	Sub. Perc. Thin Billet	AB7-10
	Edge Unit 2	Possible	+ 48	Min. Shear Shape P.F.	AB6-13(a)
023		Highly Probable	+ 82	Sub. Press. Thin with P.F.	AB8-6
small scar grouping	Edge Unit 1(a)	Highly Probable	+ 86	Min. Press. Thin with P.F.	AB9-5(b)
small scar grouping	Edge Unit 1(b)	Highly Probable	+ 72	Min. Shear Shape with P.F.	AB6-13(a)
R6		Possible	+ 46	Mod./Sub. Perc. Thin Billet	AB5-9(a) and AB7-10
R12		Highly Probable	+ 86	Sub. Press. Thin with P.F.	AB8-6
R32	scars R27 - R32	Highly Probable	+ 86	Min. Press. Thin with P.F.	AB9-5(b)

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units: C02135

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Substantial and Moderate Percussion Thin with Billet: This behavior unit was used for face paring the specimen on both the obverse and reverse faces. Face paring produces the familiar biface thinning flakes. Production Unit Code is 40:3/4, 41, 51.

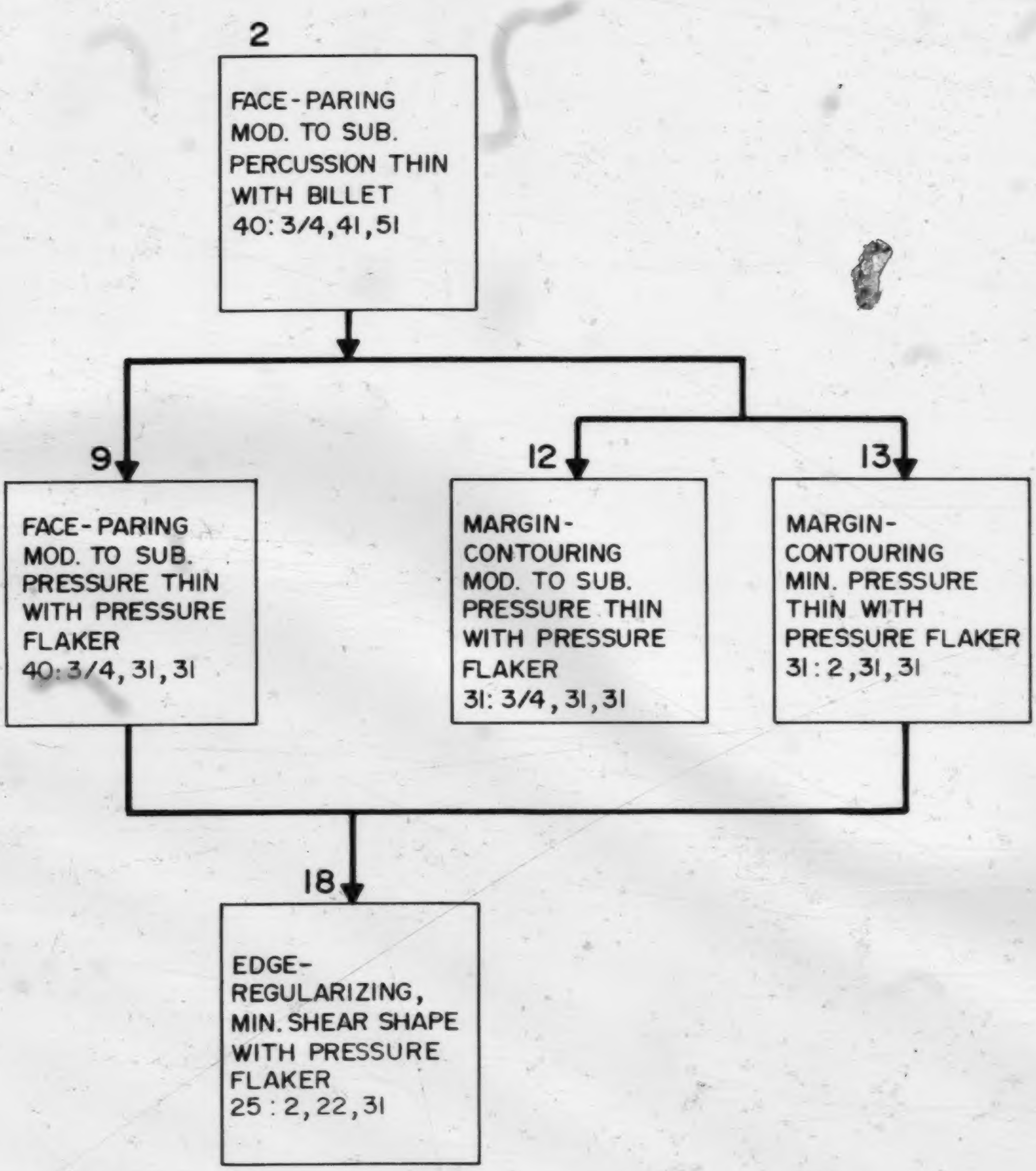
3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

(a) Minimum to Substantial Pressure Thin with Pressure Flaker: These behavior units were used for face paring. Production Unit 40:2/3/4, 31, 31.

(b) The same behavior units (above) were also used for margin contouring - in this case it involved removing material from an overly thick edge. Production Unit Code is 31:2/3/4, 31, 31.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

One edge unit was identified, minimal shear shape with a pressure flaker. This unit was used at the top of the specimen to straighten the edge primarily by reducing the U-shaped pressure notches (found on all pressure flaking platforms) to very shallow indistinct notches. The unit also strengthens and reduces the edge although the secondary reducing effect on this specimen was very minimal. Production Unit Code is 23/24/25:2, 22, 31.


2
FACE-PARING MOD. TO SUB. PERCUSSION THIN WITH BILLET 40: 3/4, 41, 51
9
FACE-PARING MOD. TO SUB. PRESSURE THIN WITH PRESSURE FLAKER 40: 3/4, 31, 31
12
MARGIN-CONTOURING MOD. TO SUB. PRESSURE THIN WITH PRESSURE FLAKER 31: 3/4, 31, 31
13
MARGIN-CONTOURING MIN. PRESSURE THIN WITH PRESSURE FLAKER 31: 2, 31, 31
18
EDGE-REGULARIZING, MIN. SHEAR SHAPE WITH PRESSURE FLAKER 25: 2, 22, 31

(b) Reconstructing Sequencing of Production Units: C02135

3.4 Flow Diagram of Production Units (above)

3.5 Description and Discussion of Technological Grammar Found on Artifact

The above biface rough out comprising a bi-pointed preform, broke before completion and was abandoned by the aboriginal flint knappers prior to completion. The primary thinning on the specimen consists of substantial and moderate percussion thinning with an antler billet (see flake scars 05, 012, and R6). The face paring produces the familiar biface thinning flakes. Following and overlying the percussion work (see scar R12 overlaid on scar R14) is substantial pressure thinning with a pressure flaker. The purpose of this thinning (face paring) unit may have been margin contouring (i.e., removing thin flakes on the margin to produce the desired curvature and reduce an overly thick edge). At the tip of the specimen, minimal pressure thinning with a pressure flaker was used to remove a series of identifiable parallel pressure flakes on both faces. This created the desired bifacial edge. As pressure flaking always leaves U-shaped notches and percussion flaking always leaves flat curved notches (see experiments), in order to straighten the edge, an edge unit was utilized. Both in areas of percussion flaking and substantial pressure flaking a sporadically applied minimal shear shape with pressure flaker was used for edge centering, straightening and regularizing. At the tip of the specimen and overlying the minimal pressure flaking a more uniform but very minimal moderate shear shape with pressure flake was used. At this point the artifact was still far from being a completed biface and required further percussion thinning to remove a large lump of material (flakes R23, 25, 10, 11). An attempt to do this from the opposite or obverse side failed and broke the specimen. It is interesting to note that part of the original platform from the flake that broke the specimen is still present and attached to scar O-12.

DdGw-2 — CO 2135

OBVERSE FACE

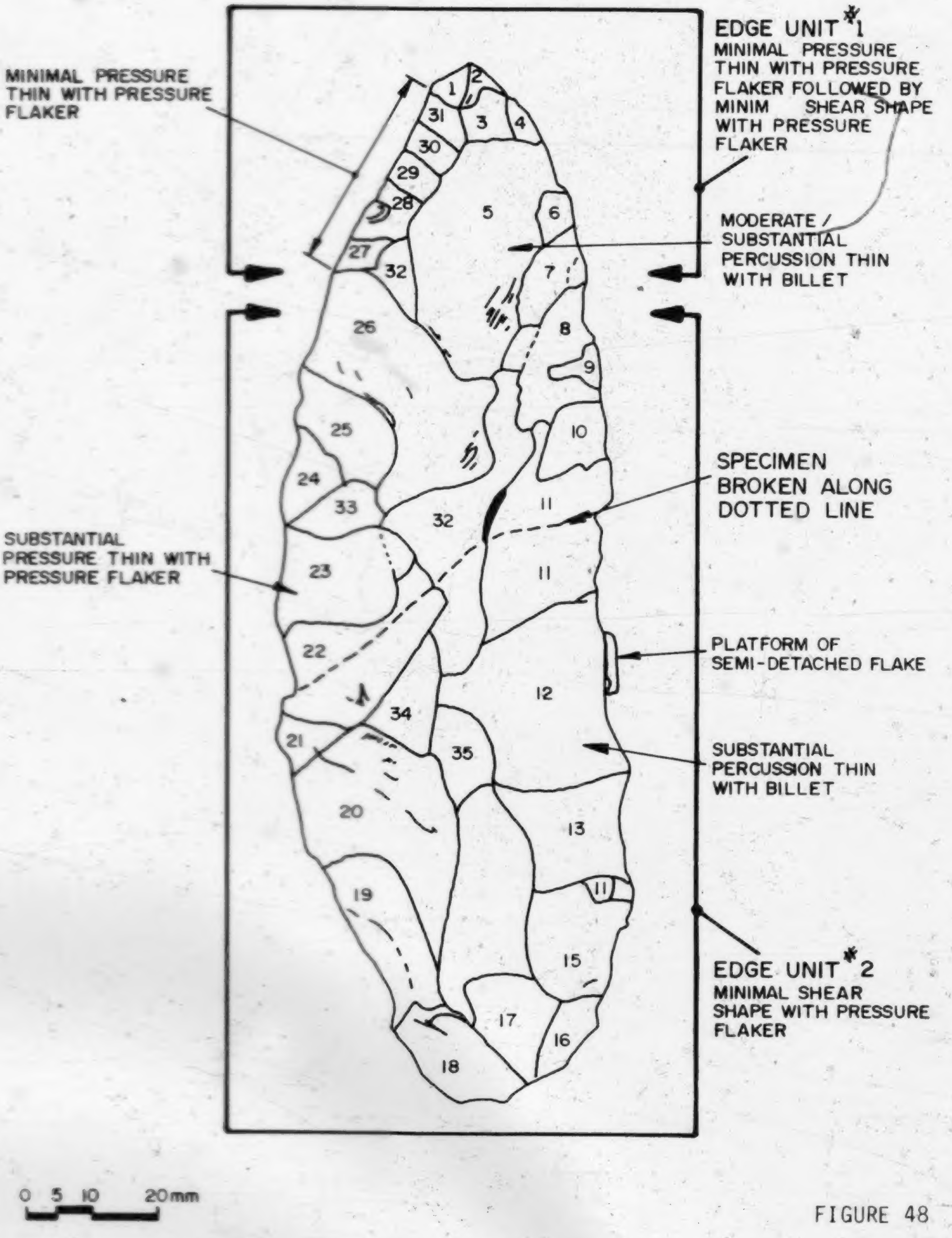

EDGE UNIT #1
MINIMAL PRESSURE THIN WITH PRESSURE FLAKER FOLLOWED BY MINIM SHEAR SHAPE WITH PRESSURE FLAKER
MINIMAL PRESSURE THIN WITH PRESSURE FLAKER
MODERATE / SUBSTANTIAL PERCUSSION THIN WITH BILLET
SPECIMEN BROKEN ALONG DOTTED LINE
SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
PLATFORM OF SEMI-DETACHED FLAKE
SUBSTANTIAL PERCUSSION THIN WITH BILLET
EDGE UNIT #2
MINIMAL SHEAR SHAPE WITH PRESSURE FLAKER
1
2
31
3
4
30
29
28
5
6
27
32
7
26
8
9
25
10
24
33
32
11
23
11
22
12
34
21
35
20
13
11
19
15
17
16
18
0 5 10 20mm

FIGURE 48

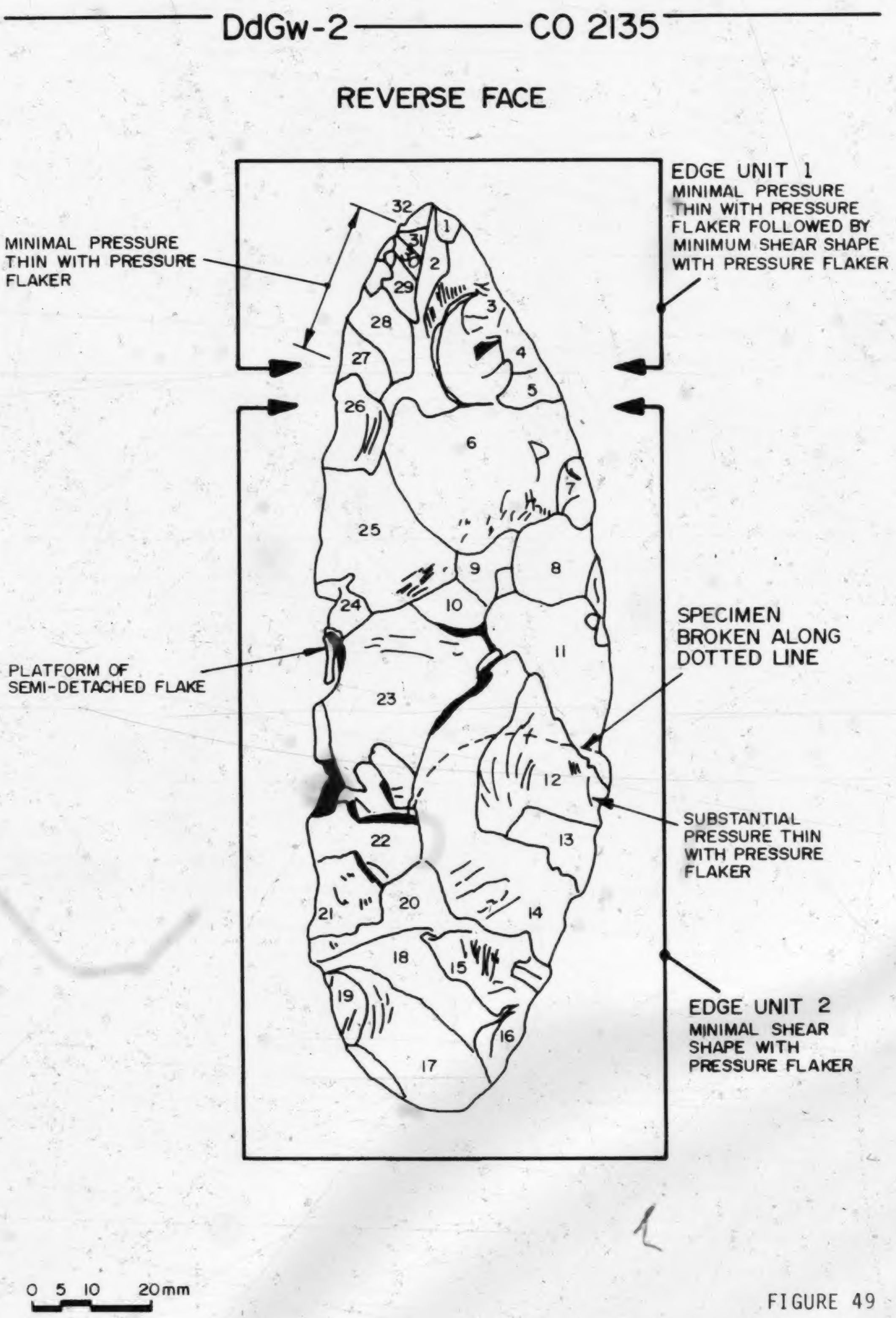

DdGw-2
CO 2135
REVERSE FACE
EDGE UNIT 1
MINIMAL PRESSURE THIN WITH PRESSURE FLAKER FOLLOWED BY MINIMUM SHEAR SHAPE WITH PRESSURE FLAKER
MINIMAL PRESSURE THIN WITH PRESSURE FLAKER
PLATFORM OF SEMI-DETACHED FLAKE
SPECIMEN BROKEN ALONG DOTTED LINE
SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
EDGE UNIT 2
MINIMAL SHEAR SHAPE WITH PRESSURE FLAKER
0 5 10 20mm

FIGURE 49

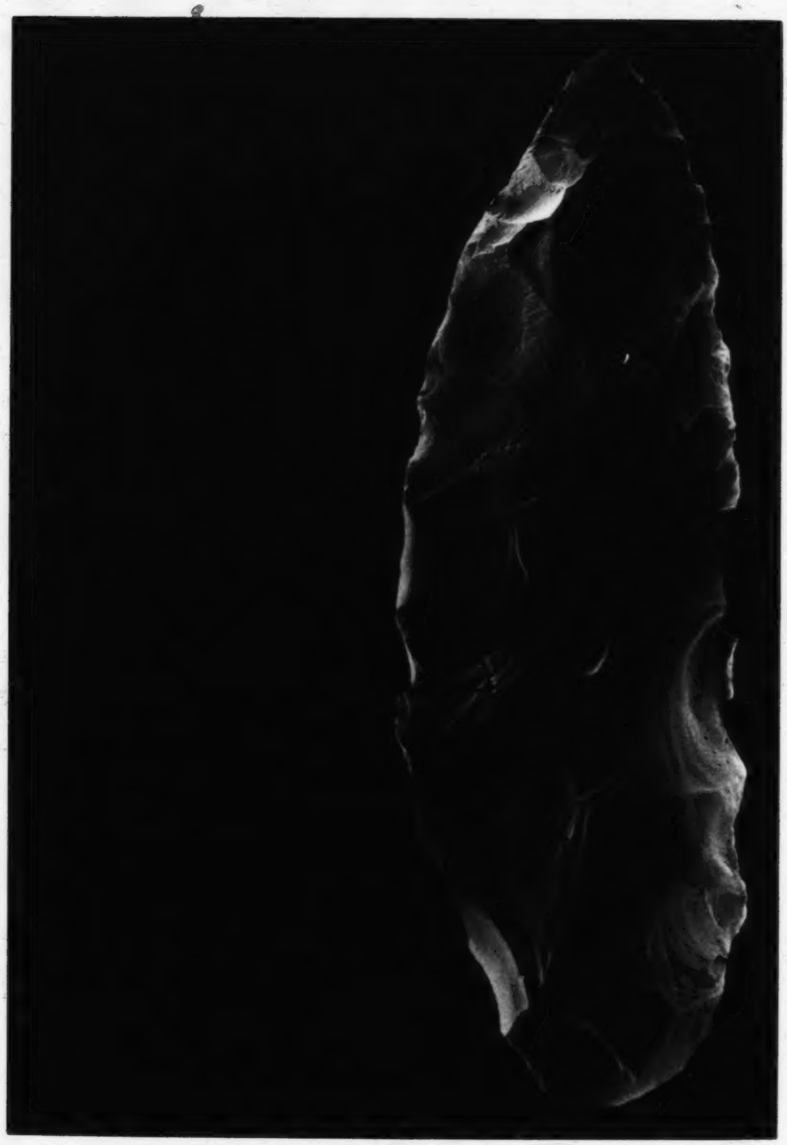


Plate 58. Prehistoric Artifact C02135, Obverse Face.

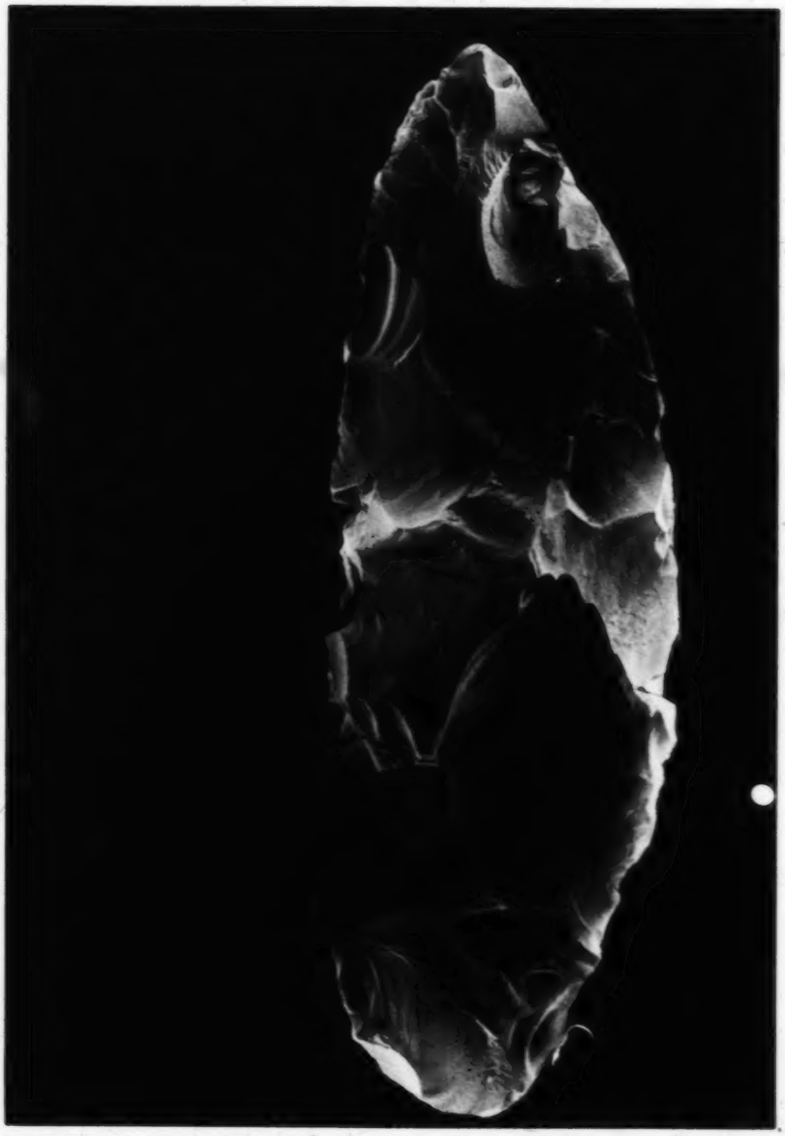


Plate 59. Prehistoric Artifact C02135, Reverse Face.

Table 67: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: Jessup, DdGw-2

1.3 Specimen Catalogue #: C02082

1.4 Photographic Plate Identification: Roll 3, B3, #4
Roll 3, B4, #29

1.5 Standard Artifact Description:

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: Bi-pointed Biface

1.8 Flaking (Bifacial/Unifacial): Bifacial

1.9 Metric Size: length - 13.70 cm
width - 3.63 cm
thickness - 1.19 cm

1.10 Form/Morphology Description:

This bi-pointed biface snapped at mid-section due to removal of an overly thick thinning flake that resulted in a hinged step fracture which broke the specimen. The overall artifact is rather narrow and tapers at each end to a blunted slightly convex points and/or bases. Only a small portion of the original flake core surface remains on the reverse side.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02082	Main Flake Scar # 021	Edge Treatment on Same Scar	Notes
1.1	Scar Size	sub.	min. (1)	1. Edge Unit 1 - scars 1-8 and scars 17-36 obverse face, and scars 1-11 and 19-23 reverse face.
2.1	Edge Sharpness		intermediate to sharp	
2.2	Margin Damage		0	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		straight	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	0		
4.3	Rib Spacing And Distribution	0		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight/ rounded	rounded, some straight	
5.2	Scar Termination at Distal Edge	feather	pred. feather some step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 021, C02082

	Prehistoric C02082 Scar 021	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.	AB16-17(a) Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	0	+ 50 - 50	+ 66.7 - 33.3	+ 20 - 80
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 75 - 25	+ 66.7 - 33.3	+ 60 - 40

5.1	straight/ rounded	+ 50 - 50	+ 33.3 - 66.7	+ 1
5.2	feather	+ 25 - 75	+ 1	+ 40 - 60
Total	+	+ 5	+ 6.33	+ 6
	-	- 3	- 1.67	- 2
%	+	+ 63	+ 79	+ 75
	-	- 37	- 21	- 25
Score		+ 26	+ 58	+ 50

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 50 - Mod./Sub. Perc. Thin Hammerstone

N.B.
The above scar was identified as mod./sub. perc. thin hammerstone based on the size, thinness and flatness, plus the very indistinct percussion bulb.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02082, Edge Unit 1 (coded on scar 021)

	Prehistoric C02082 Edge Unit 1	AB10-1 Min. Rub Buffet Hammerstone	AB10-1(b) Min. Rub Buffet Billet	AB6-13(a) Min. Shear Shape P.F.	AB6-13(b) Mod. Shear Shape P.F.	AB15-18(b) Min. Perc. Shape Billet
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate to sharp	+ 1	+ 15 - 85	+ 1	+ 50 - 50	+ 50 - 50
2.2	0	- 1	+ 85 - 15	+ 83.3 - 16.7	- 1	- 1
2.3	heavy	- 1	- 1	+ 66.7 - 33.3	+ 1	+ 80 - 20
2.4	straight	+ 1	+ 1	+ 1	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	pred. rounded some straight	+ 75 - 25	- 1	+ 50 - 50	+ 50 - 50	+ 1
5.2	pred. feather some step	+ 80 - 20	+ 1	+ 50 - 50	+ 1	+ 1
Total	+	+ 4.55	+ 4	+ 5.5	+ 5	+ 5.3
	-	- 2.45	- 3	- 1.5	- 2	- 1.7
%	+	+ 65	+ 57	+ 79	+ 71	+ 76
	-	- 35	- 43	- 21	- 29	- 24
Score		+ 30	+ 14	+ 58	+ 42	+ 52

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 58 - Min. Shear Shape P.F.
Possible + 42 - Mod. Shear Shape P.F.

Unit identified as moderate shear shape with pressure flaker.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02082	Main Flake Scar # 041	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very sub.	(1)	1. Edge Unit 1 (see scar 021).
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 041, C02082

	Prehistoric C02082 Scar 041	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.	AB16-17(a) Mod./Sub. Perc. Thin Hammerstone
1.1	very substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 75 - 25	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	0	+ 50 - 50	+ 66.7 - 33.3	+ 20 - 80
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 75 - 25	+ 33.3 - 66.7	+ 1

5.1	straight	- 1	+ 33.3 - 66.7	+ 60 - 40
5.2	feather	+ 25 - 75	+ 1	+ 40 - 60
Total	+	+ 4.5	+ 6	+ 6
	-	- 3.5	- 2	- 2
%	+	+ 56	+ 75	+ 75
	-	- 44	- 25	- 25
Score		+ 12	+ 50	+ 50

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 50 - Mod./Sub. Perc. Thin Hammerstone

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02082	Main Flake Scar # 032	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. Edge treatment #1, unifacial production unit applied from the reverse face (i.e., the reverse side was used as a platform. (See scar 021).
2.1	Edge Sharpness	sharp (2)		
2.2	Margin Damage	n/a		
2.3	Microflakes	n/a		
2.4	Proximal Edge Morphology	n/a		2. Edge treatment not pronounced on this scar - platform intact enough for coding.
3.1	Negative Bulb of Force	distinct		
3.2	Bulb to Scar Transition Angle	steep		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	step		

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02082	Main Flake Scar # R2	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	(1)	1. Edge Unit 1 - see 021.
2.1	Edge Sharpness	sharp		
2.2	Margin Damage	n/a		
2.3	Microflakes	n/a		
2.4	Proximal Edge Morphology	flat curved notch		
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 032, C02082

	Prehistoric C02082 Scar 032	AB5-9(a) Mod. Perc. Thin Billet	AB15-18(a) Mod. Perc. Shape Billet	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB3-17 Mod. Perc. Shape Hammerstone
1.1	moderate	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 1
2.2	n/a	n/a	n/a	n/a	n/a
2.3	n/a	n/a	n/a	n/a	n/a
2.4	n/a	n/a	n/a	n/a	n/a
3.1	distinct	+ 20 - 80	+ 14.28 - 85.72	- 1	- 1
3.2	gradual	+ 80 - 20	+ 1	+ 1	+ 1
3.3	thin	+ 80 - 20	+ 85.72 - 14.28	+ 80 - 20	+ 1
4.1	0	+ 80 - 20	+ 85.72 - 14.28	+ 20 - 80	+ 66.7 - 33.3
4.2	n/a	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a	n/a
4.4	0	+ 80 - 20	+ 85.72 - 14.28	+ 60 - 40	+ 66.7 - 33.3

5.1	straight	+ 60 - 40	+ 57.1 - 42.9	+ 60 - 40	+ 1
5.2	feather	+ 50 - 50	+ 28.6 - 71.4	+ 40 - 60	+ 33.3 - 66.7
Total	+	+ 6.5	+ 5.57	+ 5.6	+ 6.7
	-	- 2.5	- 3.43	- 3.4	- 2.3
%	+	+ 72	+ 62	+ 62	+ 74
	-	- 28	- 38	- 38	- 26
Score		+ 44	+ 24	+ 24	+ 48

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 48 - Moderate Percussion Shape Hammerstone

N.B.

Although the scores are close here - hammerstone is identified, as a hammerstone was used elsewhere in the specimen.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R2, C02082

	Prehistoric C02082 Scar R2	AB7-10 Sub. Perc. Thin Billet	AB5-9(a) Mod. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.	AB16-17(a) Mod./Sub. Perc. Thin Hammerstone
1.1	substantial	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 1
2.2	n/a	n/a	n/a	n/a	n/a
2.3	n/a	n/a	n/a	n/a	n/a
2.4	flat curved notch	+ 1	+ 1	+ 1	+ 1
3.1	indistinct	+ 75 - 25	+ 80 - 20	+ 66.7 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 80 - 20	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 80 - 20	+ 1	+ 80 - 20
4.1	0	+ 50 - 50	+ 80 - 20	+ 66.7 - 33.3	+ 20 - 80
4.2	n/a	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a	n/a
4.4	light	+ 25 - 75	+ 20 - 80	+ 33.3 - 66.7	+ 40 - 60

5.1	straight	- 1	+ 60 - 40	- 1	+ 60 - 40
5.2	feather	+ 25 - 75	+ 50 - 50	+ 1	+ 40 - 6[illegible]
Total	+	+ 6	+ 7.5	+ 7.67	+ 7.4
	-	- 4	- 2.5	- 2.33	- 2.6
%	+	+ 60	+ 75	+ 77	+ 74
	-	- 40	- 25	- 23	- 26
Score		+ 20	+ 50	+ 54	+ 48

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 48 - Mod./Sub. Perc. Thin Hammerstone

Based on the flatness of the flakes and the indistinct percussion bulbs plus the presence of other hammerstone work on the specimen, the above scar is tentatively identified as hammerstone percussion, even though billet and hammerstone have essentially identical scores.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02082	Main Flake Scar # R3	Edge Treatment on Same Scar	Notes
1.1	Scar Size	sub.	(1)	1. Edge Unit 1 - see scar 021.
2.1	Edge Sharpness	sharp (2)		2. Platform intact enough for coding.
2.2	Margin Damage	n/a		
2.3	Microflakes	n/a		
2.4	Proximal Edge Morphology	flat curved notch		
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R3, C02082

	Prehistoric C02082 Scar R3 * and R4
1.1	sub.
2.1	sharp
2.2	n/a
2.3	n/a
2.4	flat curved notch
3.1	indistinct
3.2	gradual
3.3	thin
4.1	0
4.2	n/a
4.3	n/a
4.4	light

5.1	straight	
5.2	feather	
Total	+	
	-	
%	+	
	-	
Score		

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 48 - Mod./Sub. Percussion Thin with Hammerstone

* Same morphology and identification as previous scar R2.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02082	Main Flake Scar # R20	Edge Treatment on Same Scar	Notes
1.1	Scar Size	mod.	(1)	1. Edge Unit 1 - see scar 021.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	0		
4.3	Rib Spacing And Distribution	0		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R20, C02082

	Prehistoric C02082 Scar R20	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB3-17 Mod. Perc. Shape Hammerstone	AB5-9(b) Mod. Perc. Thin Billet	AB15-18(a) Mod. Perc. Shape Billet
1.1	moderate	+ 1	+ 1	+ 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 1	+ 1	+ 80 - 20	+ 85.72 - 14.28
3.2	gradual	+ 1	+ 1	+ 1	+ 80 - 20
3.3	thin	+ 80 - 20	+ 1	+ 80 - 20	+ 85.12 - 14.28
4.1	0	+ 20 - 80	+ 33.3 - 66.7	+ 80 - 20	+ 85.12 - 14.28
4.2	n/a	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a	n/a
4.4	0	+ 60 - 40	+ 66.7 - 33.3	+ 40 - 60	+ 42.9 - 57.1

5.1	straight	+ 60 - 40	+ 1	+ 60 - 40	+ 57.1 - 42.9
5.2	feather	+ 40 - 60	+ 33.3 - 66.7	+ 50 - 50	+ 71.4 - 28.6
Total	+	+ 5.6	+ 6.33	+ 5.9	+ 6.09
	-	- 2.4	- 1.67	- 2.1	- 1.91
%	+	+ 70	+ 79	+ 74	+ 76
	-	- 30	- 21	- 26	- 24
Score		+ 40	+ 58	+ 48	+ 52

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 58 - Mod. Perc. Shape Hammerstone

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02082	Main Flake Scar # n/a	Edge Treatment on Same Scar	Notes
1.1	Scar Size	n/a (2)	very min. (1)	1. Edge Unit 2 scars 9-16 obverse side and scars 12-18 reverse side.
2.1	Edge Sharpness		intermediate	
2.2	Margin Damage		heavy	2. No main scars coded with this edge unit. Contains coding for edge unit #3 only.
2.3	Microflakes		0	
2.4	Proximal Edge Morphology		straight	
3.1	Negative Bulb of Force			
3.2	Bulb to Scar Transition Angle			
3.3	Flake Thickness			
4.1	Presence or Absence of Ribs			
4.2	Distinctiveness of Ribs			
4.3	Rib Spacing And Distribution			
4.4	Tearing			
5.1	Scar Shape at Distal Edge		pred. straight	
5.2	Scar Termination at Distal Edge		pred. step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, Edge Unit #2, C02082

	Prehistoric C02082 Edge Unit 2	AB10-1(b) Min. Rub Buffet/Billet	AB10-1(a) Min. Rub Buffet Hammerstone	AB6-13(a) Min. Shear Shape P.F.	AB14-16(b) Min. Perc. Shape Hammerstone
1.1	very min.	+ 1	+ 1	+ 1	+ 1
2.1	intermediate	+ 75 - 85	+ 1	+ 66.7 - 33.3	+ 83.3 - 16.7
2.2	heavy	- 1	+ 1	+ 66.7 - 33.3	+ 1
2.3	0	+ 25 - 15	+ 1	+ 33.3 - 66.7	+ 1
2.4	straight	+ 1	+ 1	+ 1	+ 83.3 - 16.6
3.1					
3.2					
3.3					
4.1					
4.2					
4.3					
4.4					

5.1	pred. straight	- 1	+ 50 - 50	+ 50 - 50	+ 33.3 - 66.7
5.2	pred. step	- 1	+ 80 - 20	- 1	+ 33.3 - 66.7
Total	+	+ 3	+ 6.3	+ 4.17	+ 5.33
	-	- 4	- .7	- 2.83	- 1.67
%	+	+ 43	+ 90	+ 60	+ 76
	-	- 57	- 10	- 40	- 24
Score		- 14	+ 80	+ 20	+ 52

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 80 - Min. Rub/Buffet Hammerstone

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact, C02082 (Jessup)

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
021		Possible	+ 50	Mod./Sub. Perc. Thin Hammerstone	AB16-17(a)
	Edge Unit 1	Possible	+ 58	Mod. Shear Shape with P.F.	AB6-13(a)
041		Possible	+ 50	Mod./Sub. Perc. Thin Hammerstone	AB16-17(a)
032		Possible		Mod. Perc. Shape Hammerstone	AB3-17
R2		Possible	+ 48	Mod./Sub. Percussion Thin with Hammerstone	AB16-17(a)
R3		Possible	+ 42	Mod./Sub. Percussion Thin with Hammerstone	AB16-17(a)
R20		Possible	+ 58	Mod. Percussion Shape Hammerstone	AB3-17
	Edge Unit 2	Highly Probable	+ 80	Min. Rub/Buffet Hammerstone	AB10-1(a)

3.0 Interpretation of Behavior (Technological) Units, C02082

(a) Transforming Behavior Units into Production Units:

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Mod./Sub. Percussion Thin with Hammerstone: Thinning or face paring was also accomplished with a hammerstone (scars 021, 041, R2, R3). Production Unit Code is 40:3/4, 41, 41.

(b) Moderate Percussion Shape with Hammerstone: The shape units were used for margin moving (i.e., to control its outline form rather than having thinning as the primary objective). Some of the shaping flakes may be thinning flakes as these are also present (see below). Production Unit Code is 33:4, 42, 41.

3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

There are no pressure flaking behavior units on this prehistoric artifact.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

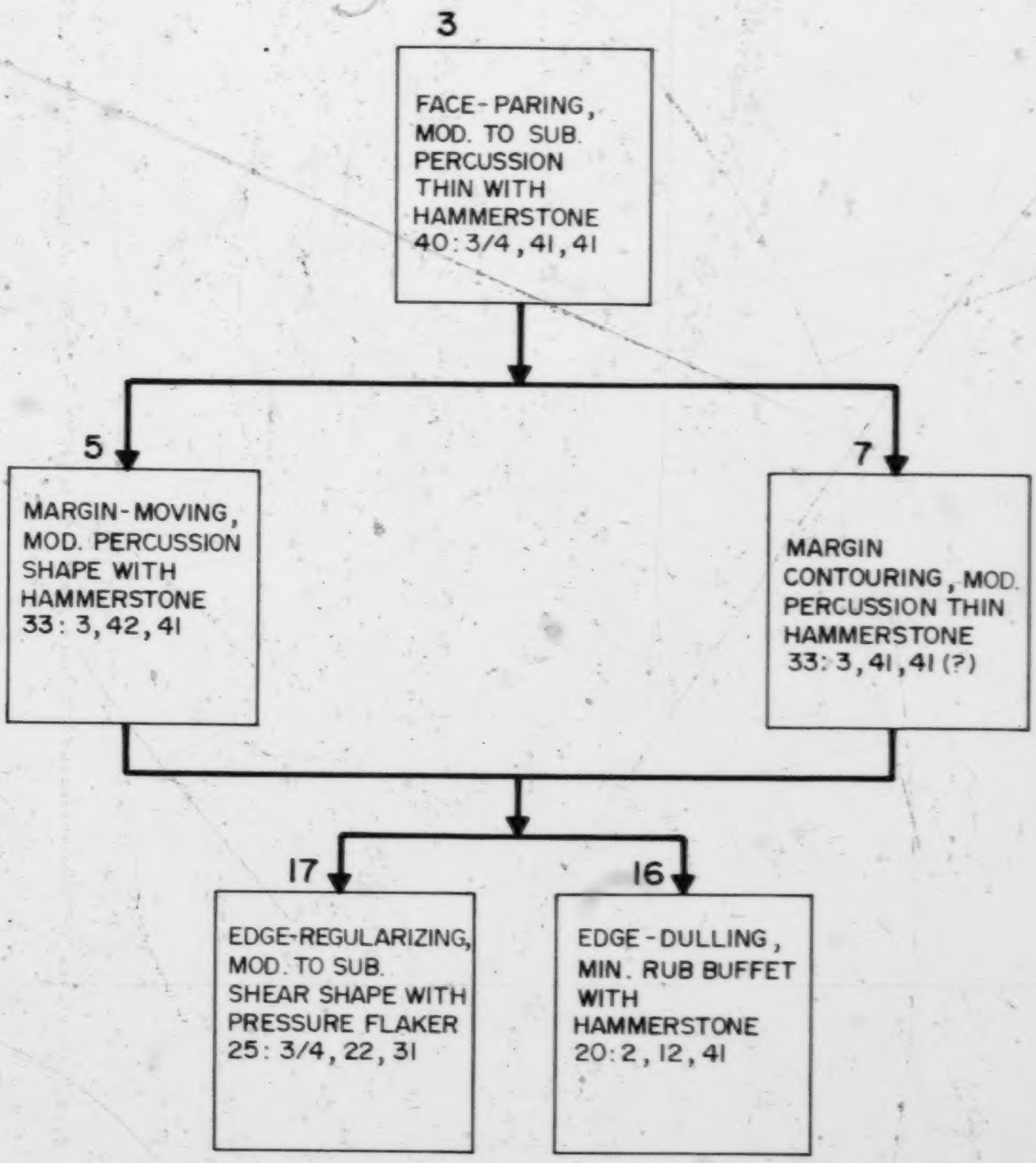
(a) Minimum to Moderate Shear Shape with Pressure Flaker: This unit was used (see edge unit 1) to straighten, center, and reduce the edge. Edge straightening was undertaken by smoothing out the flat curved notches left by percussion work. Shearing is accomplished by moving the tip of the pressure flaker across the edge of the artifact in a twisting motion. Production Unit Code is 23/24/25:2/4, 22, 31.

(b) Minimum Rub/Buffet with Hammerstone: Rub buffet involves edge dulling achieved by rubbing the edge of the artifact, while at the same time, dragging the tool with minimal force. This removal of little, flat (often square ended) flakes blunts or rounds the edge so it will not crush easily when used as a platform. An alternative purpose would be to smooth the edge (see edge unit 2). Production Unit Code is 20:2, 12, 41.

(c) Hypothetical Unit - Moderate Percussion Thin with Hammerstone: Due to overlapping behavior unit and scars, it was not possible to code this unit directly. The hammerstone work scored a + 52 along with the hammerstone rub/buffet (see coding of edge unit #2). Such thinning units are used for margin contouring which is accomplished by removing short, flat flakes on artifact margins to lessen the edge angle. The edge would be subsequently strengthened if this was followed by the rub/buffet as coded. Production Unit Code for minimal hammerstone thinning used for margin contouring is 33:3, 41, 41.

(b) Reconstructing Sequencing of Production Units: C02082

3.4 Flow Diagram of Production Units (below)

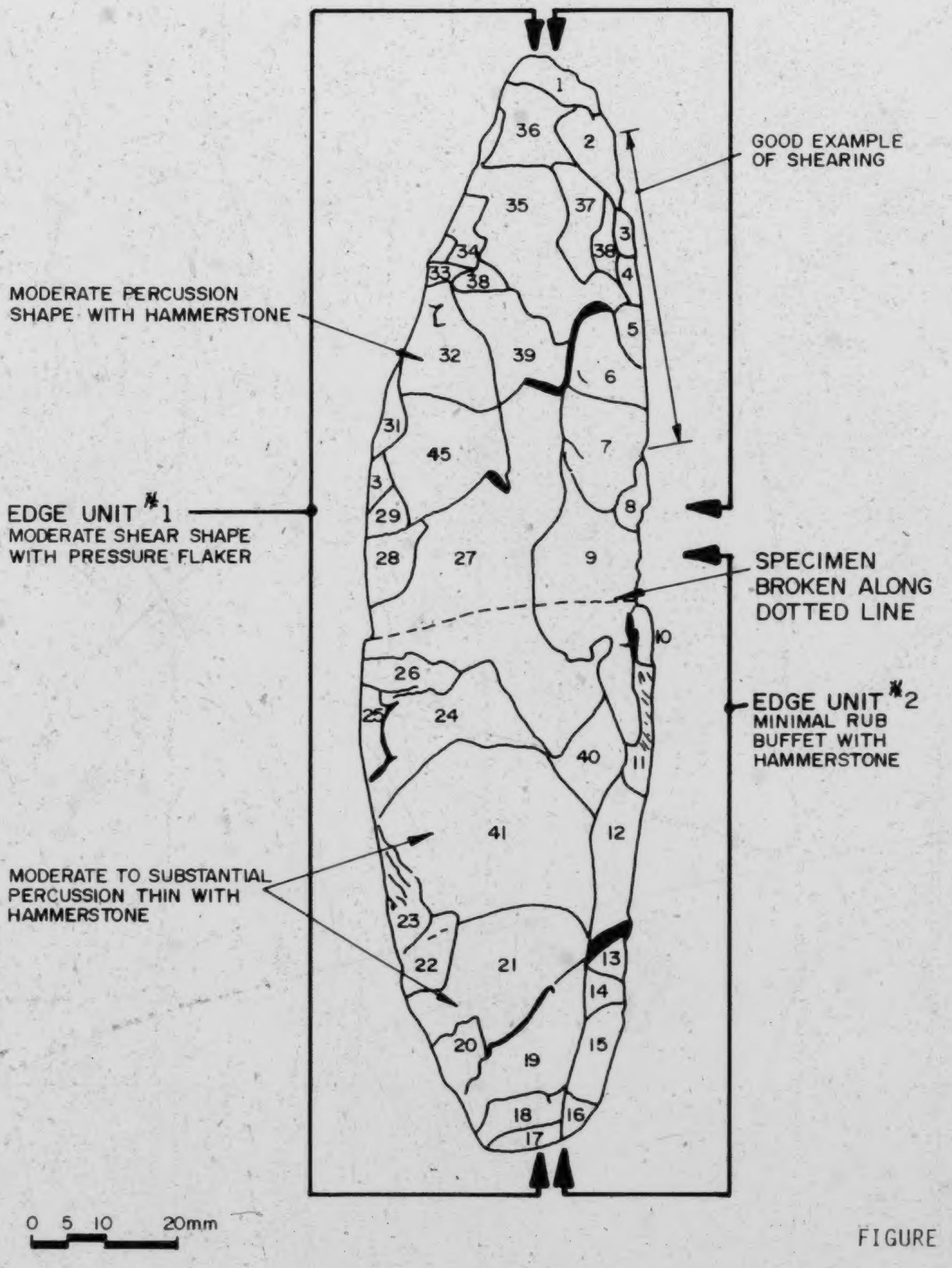

3
FACE-PARING, MOD. TO SUB. PERCUSSION THIN WITH HAMMERSTONE 40:3/4,41,41
5
MARGIN-MOVING, MOD. PERCUSSION SHAPE WITH HAMMERSTONE 33:3,42,41
7
MARGIN CONTOURING, MOD. PERCUSSION THIN HAMMERSTONE 33:3,41,41(?)
17
EDGE-REGULARIZING, MOD. TO SUB. SHEAR SHAPE WITH PRESSURE FLAKER 25:3/4,22,31
16
EDGE-DULLING, MIN. RUB BUFFET WITH HAMMERSTONE 20:2,12,41

3.5 Description and Discussion of Technological Grammar Found on Artifact

This prehistoric biface was manufactured from a flake core (scar R26 exhibits the original core surface). The flake core was shaped, utilizing substantial percussion face paring flakes with a hammerstone followed by moderate margin moving percussion shaping. This initial percussion work shaped the bi-pointed specimen and thinned it to a reasonable thickness, but not to a finished state. In order to undertake the final thinning work the edge was prepared by means of minimal shear shaping with a pressure flaker (see edge unit 1) which straightened, centered and strengthened the edge. Other edges (edge unit 2) may have been too thick for shearing (i.e., scar 015) and instead, a minimum percussion thin with hammerstone was used for margin contouring (i.e., removing short flat flakes on the artifact margin to reduce the edge angle). This was followed by a minimum rub/buffet with the hammerstone to blunt or round the edge and strengthen it. Subsequent to this work, one of the finishing thinning flakes (possibly 09/R18) was too powerful and caused a bilateral transverse fracture which broke the artifact in half causing it to be abandoned.

DdGw-2 —— CO 2082

OBVERSE FACE



GOOD EXAMPLE OF SHEARING

MODERATE PERCUSSION SHAPE WITH HAMMERSTONE

EDGE UNIT #1
MODERATE SHEAR SHAPE WITH PRESSURE FLAKER

SPECIMEN BROKEN ALONG DOTTED LINE

EDGE UNIT #2
MINIMAL RUB BUFFET WITH HAMMERSTONE

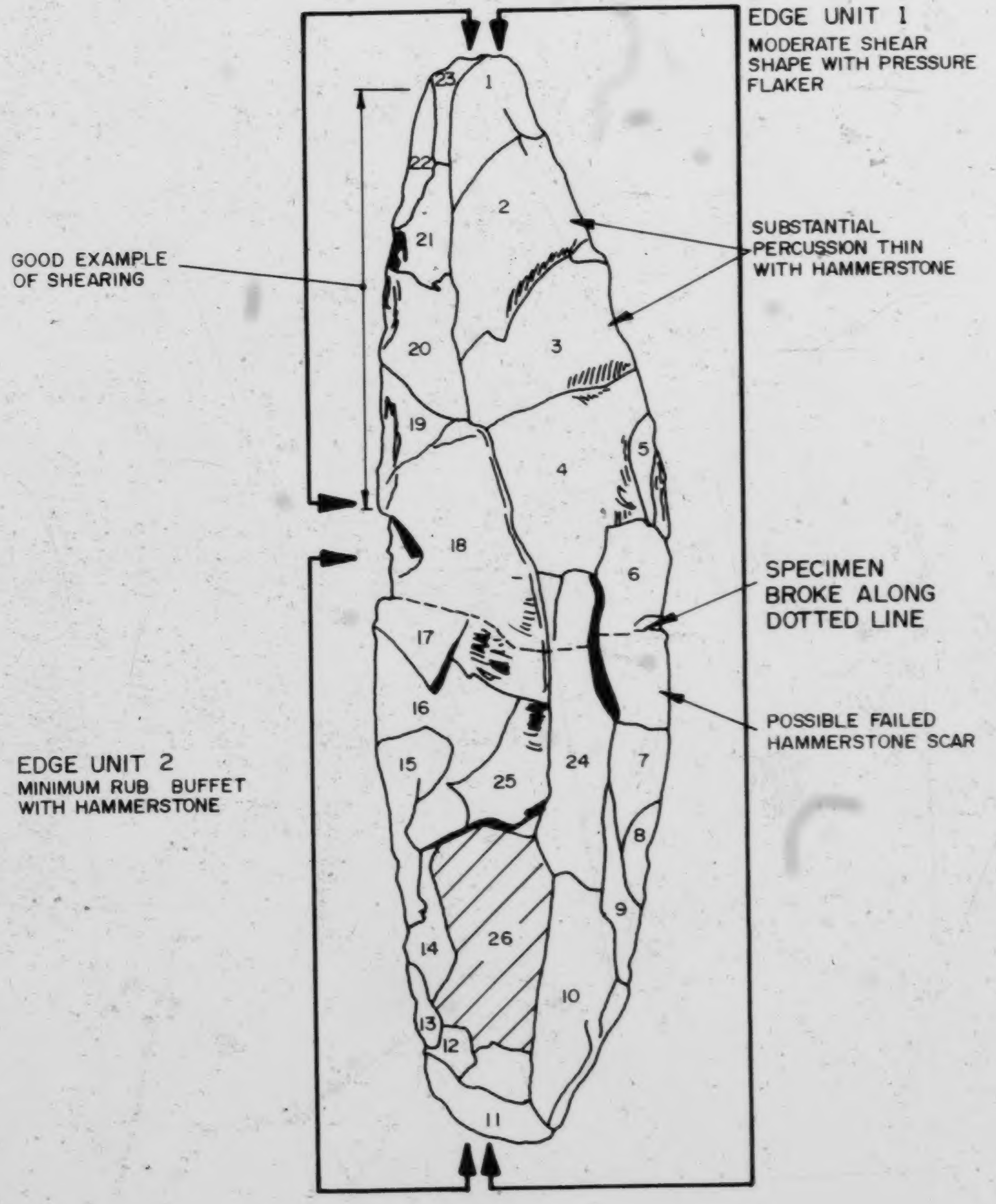
MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE

1
36
2
35
37
3
38
4
34
33
38
5
32
39
6
31
45
7
3
8
29
28
27
9
10
26
25
24
40
11
41
12
23
22
21
13
14
20
19
15
18
16
17
0 5 10 20mm

FIGURE 50

DdGw-2 — CO 2082

REVERSE FACE


EDGE UNIT 1
MODERATE SHEAR SHAPE WITH PRESSURE FLAKER
GOOD EXAMPLE OF SHEARING
SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
SPECIMEN BROKE ALONG DOTTED LINE
POSSIBLE FAILED HAMMERSTONE SCAR
EDGE UNIT 2
MINIMUM RUB BUFFET WITH HAMMERSTONE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
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16
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18
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21
22
23
24
25
26

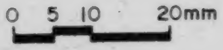


FIGURE 51

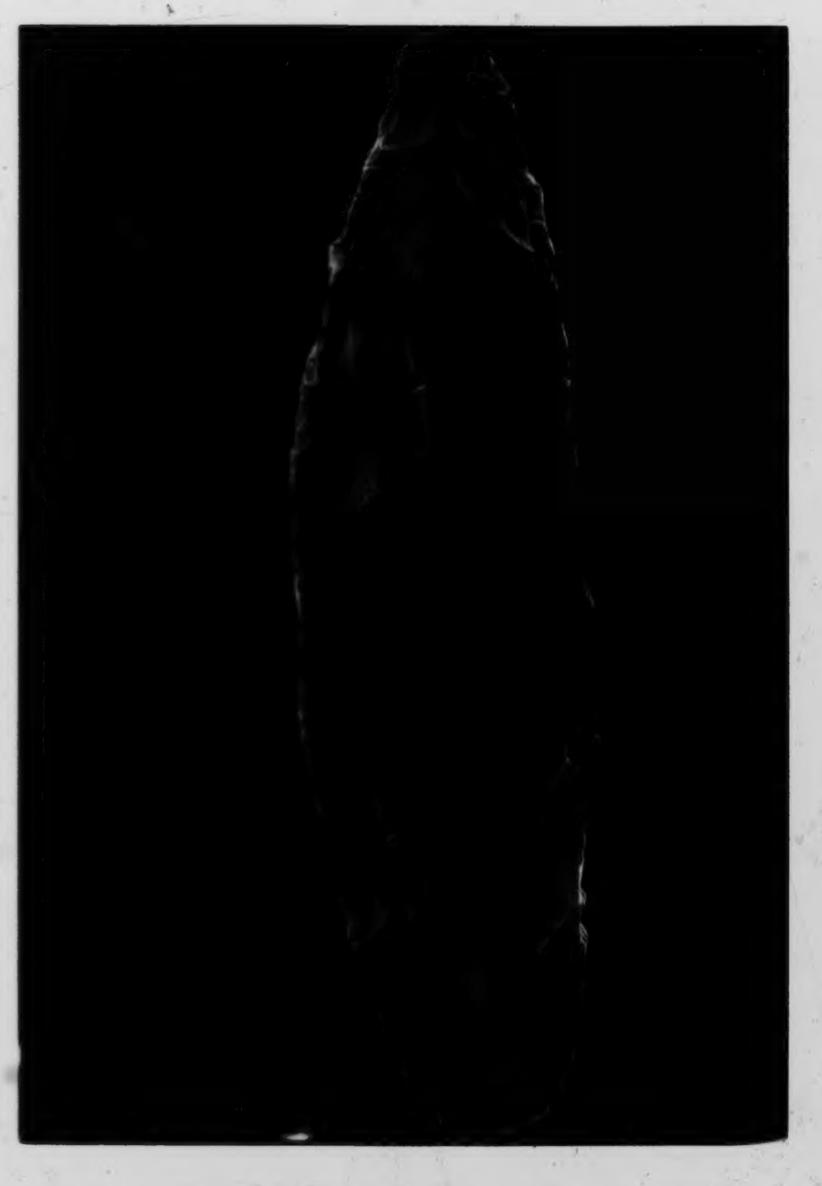


Plate 60. Prehistoric Artifact C02082, Obverse Face.

Plate 61. Prehistoric Artifact C02082, Reverse Face.

Table 68: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: Jessup Site, DdGw-2

1.3 Specimen Catalogue #: C02070

1.4 Photographic Plate Identification: Roll 4, B4, #7

1.5 Standard Artifact Description:

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: Biface

1.8 Flaking (Bifacial/Unifacial):

1.9 Metric Size:
length - 9.31 cm
width - 4.24 cm
thickness - .94 cm

1.10 Form/Morphology Description:

This specimen comprises a broad bifacial tool with a broad but shallow convex to straight base with rounded corners. During final thinning the specimen broke bilaterally and has been glued back together for analysis. It appears that it may have been manufactured from a flake core as a small portion of the original surface remains on the obverse face and an original detachment platform on the base of the flake core.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02070	Main Flake Scar # 015	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very sub.	minimal (1)	1. Edge Unit 2 - scars 11-13 obverse face, scars 12-19 reverse face.
2.3	Edge Sharpness		sharp	
2.2	Margin Damage		heavy	
2.3	Microflakes		0	
2.4	Proximal Edge Morphology		straight with convex project.	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart & evenly dist. (2)		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded	straight	
5.2	Scar Termination at Distal Edge	feather and step	feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 015, C02070

	Prehistoric C02070 Scar 015	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(a) Mod. Perc. Thin Billet	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc.
1.1	very sub.	+ 1	+ 1	+ 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 1	+ 80 - 20	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 80 - 20	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 80 - 20	+ 50 - 50	+ 1
4.1	present	+ 80 - 20	+ 20 - 80	+ 50 - 50	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1	+ 1
4.3	rel. far apart evenly dist.	+ 1	- 1	- 1	+ 1
4.4	light	+ 40 - 60	+ 20 - 80	+ 25 - 75	+ 33.3 - 66.7

5.1	rounded	+ 40 - 60	+ 40 - 60	+ 50 - 50	+ 33.3 - 66.7
5.2	feather & step	+ 1	+ 1	+ 1	+ 50 - 50
Total	+	+ 8.4	+ 6.2	+ 6.25	+ 7.17
	-	- 1.6	- 3.8	- 3.75	- 2.83
%	+	+ 84	+ 62	+ 63	+ 72
	-	- 16	- 38	- 37	- 28
Score		+ 68	+ 24	+ 26	+ 44

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 68 - Mod./Sub. Perc. Thin Hammerstone

N.B. Some very faint ribs start at impact point (necessary to rotate specimen under light in order to see ribs).

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02070, Edge Unit #2 (scar sheet 015)

	Prehistoric C02070 Edge Unit 2	AB13-15 Min. Press. Shape with P.F.	AB15-18(b) Min. Perc. Shape Billet	AB3-17 Min. Perc. Shape Hammerstone	AB16-17(b) Min. Perc. Thin Hammerstone	AB9-5(b) Min. Press. Thin with P.F.
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 1	+ 1
2.2	light	+ 1	- 1	- 1	- 1	+ 17 - 83
2.3	0	+ 1	+ 20 - 80	+ 1	+ 50 - 50	+ 1
2.4	straight or U-shaped	+ 1	+ 1	+ 33.3 - 66.7	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight	+ 50 - 50	+ 80 - 20	+ 1	+ 50 - 50	+ 58.3 - 41.7
5.2	feather	+ 88 - 12	+ 80 - 20	+ 33.3 - 66.7	+ 83.4 - 16.6	+ 41.6 - 58.4
Total	+	+ 6.38	+ 4.8	+ 4.33	+ 4.49	+ 5.17
	-	- .62	- 2.2	- 2.67	- 2.51	- 1.87
%	+	+ 91	+ 69	+ 62	+ 64	+ 74
	-	- 9	- 31	- 38	- 36	- 26
Score		+ 82	+ 38	+ 24	+ 28	+ 48

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Highly Probable + 82 - Minimum Pressure Shape with P.F.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02070	Main Flake Scar # 019	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1) very min. to minimal	1. Edge Unit 3 - scars 14-23 obverse face, scars 1-10 reverse face.
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		0	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		irreg. edge, convex projections	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	0		
4.3	Rib Spacing And Distribution	0		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	straight	rounded straight	
5.2	Scar Termination at Distal Edge	step	feather/ step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 019, C02070

	Prehistoric C02070 Scar 019	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB5-9(b) Mod. Perc. Thin Billet	AB8-6 Sub. Press. Thin P.F.
1.1	moderate	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 80 - 20	+ 1
3.2	gradual	+ 1	+ 80 - 20	+ 1
3.3	thin	+ 80 - 20	+ 80 - 20	+ 1
4.1	0	+ 20 - 80	+ 80 - 20	+ 50 - 50
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	light	+ 40 - 60	+ 20 - 80	+ 25 - 75

5.1	straight	+ 60 - 40	+ 80 - 20	+ 75 - 25
5.2	step	+ 60 - 40	+ 60 - 40	+ 25 - 75
Total	+	+ 5.6	+ 5.8	+ 5.75
	-	- 2.4	- 2.2	- 2.25
%	+	+ 70	+ 73	+ 72
	-	- 30	- 27	- 28
Score		+ 40	+ 46	+ 44

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 44 - Sub. Press. Thin with P.F.

Due to the apparent small platform and bulb of force, the pressure unit was selected, although all scores are very close. Pressure work along the edge is also present with better morphology on the reverse face.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02070, Edge Unit 3 (coded on scar form 019)

	Prehistoric C02070 Edge Unit 3	AB9-5(a) Mod. Press. Thin P.F.	AB6-13(b) Mod. Shear Shape P.F.	AB2-2(b) Min. Press. Rub with P.F.	AB16-17(b) Min. Perc. Thin Hammerstone	AB5-9(a) Min. Perc. Thin Billet
1.1	very minimal to minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 1	+ 1	+ 1
2.2	0	+ 78 - 22	- 1	- 1	+ 34 - 66	- 1
2.3	heavy	- 1	+ 1	+ 1	+ 50 - 50	+ 1
2.4	follows existing edge (code as straight) some U-shaped notches	+ 1	+ 1	+ 84 - 16	+ 1	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						

4.3							
4.4							
5.1		rounded & straight	+ 66.7 - 33.2	+ 50 - 50	+ 1	+ 1	+ 56 - 44
5.2		feather and step	+ 1	+ 1	+ 1	+ 1	+ 1
Total	+		+ 5.4	+ 5.5	+ 5.84	+ 5.84	+ 5.56
	-		- 1.6	- 1.5	- 1.16	- 1.16	- 1.44
%	+		+ 77	+ 79	+ 83	+ 83	+ 79
	-		- 33	- 21	- 17	- 17	- 21
Score			+ 44	+ 58	+ 66	+ 66	+ 58

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 66 - Min. Press. Rub P.F.
Possible + 44 - Mod. Press. Thin with P.F.

The edge exhibits the tiny bulb of force platforms, the distinctive flake scar outlines and scalloped or troughing effect produced by a pressure rub. Pressure thinning is present on scars R1 to R5 at the tip of the artifact.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02070	Main Flake Scar # R7	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	(1)	1. Edge Unit 3 - see scar 019.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart evenly dist.		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R7, C02070

	Prehistoric C02070 Scar R7	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB3-17 Mod. Perc. Shape Hammer.	AB5-9(a) Mod. Perc. Thin Billet	AB15-18(a) Mod. Perc. Shape Billet	AB8-6 Sub. Press. Thin with P.F.
1.1	moderate	+ 1	+ 1	+ 1	+ 1	+ 1
2.1						
2.2						
2.3						
2.4						
3.1	indistinct	+ 1	+ 1	+ 80 - 20	+ 85.72 - 14.28	+ 1
3.2	gradual	+ 1	+ 1	+ 80 - 20	+ 1	+ 1
3.3	thin	+ 80 - 20	+ 1	+ 80 - 20	+ 85.72 - 14.28	+ 1
4.1	present	+ 80 - 20	+ 33.3 - 66.7	+ 20 - 80	+ 14.28 - 85.72	+ 50 - 50
4.2	indistinct	+ 1	+ 1	+ 1	+ 1	+ 1
4.3	rel. far apart & evenly dist.	+ 1	+ 1	- 1	- 1	- 1
4.4	light	- 1	+ 33.3 - 66.7	+ 20 - 80	+ 14.28 - 85.72	+ 25 - 75

5.1		rounded	+ 40 - 60	- 1	+ 40 - 60	+ 42.9 - 57.1	+ 75 - 25
5.2		feather	+ 83.3 - 16.7	+ 33.3 - 66.7	+ 50 - 50	+ 71.4 - 28.6	+ 75 - 25
Total	+		+ 7.83	+ 7	+ 5.7	+ 6.14	+ 7.25
	-		- 2.17	- 3	- 4.3	- 3.86	- 2.75
%	+		+ 78	+ 70	+ 57	+ 61	+ 72
	-		- 21	- 30	- 43	- 39	- 28
Score			+ 57	+ 40	+ 14	+ 22	+ 44

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 57 - Mod./Sub. Perc. Thin Hammerstone
(Platform area is too large for pressure flaking)

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02070	Main Flake Scar # R8	Edge Treatment on Same Scar	Notes
1.1	Scar Size	sub.	(1)	1. Edge Unit 3 (see scar 019)
2.1	Edge Sharpness			2. Natural bedding planes in raw material preclude coding of ribs.
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	n/a (2)		
4.4	Tearing	heavy		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather/ step		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R8, C02070

	Prehistoric C02070 Scar R8	AB16-7(a) Mod. Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Perc. Billet/Billet
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 1	+ 50 - 50	+ 1
4.1	present	+ 80 - 20	+ 50 - 50	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1
4.3	n/a	n/a	n/a	n/a
4.4	heavy	- 1	- 1	- 1

5.1	rounded	+ 40 - 60	+ 50 - 50	+ 33.3 - 66.7
5.2	feather/ step	+ 1	+ 1	+ 50 - 50
Total	+	+ 7.2	+ 6	+ 5.83
	-	- 1.8	- 3	- 3.17
%	+	+ 80	+ 67	+ 65
	-	- 20	- 33	- 35
Score		+ 60	+ 34	+ 30

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 60 - Mod./Sub. Perc. Thin Hammerstone

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02070	Main Flake Scar # R26	Edge Treatment on Same Scar	Notes
1.1	Scar Size	moderate	minimal (1)	1. Edge Unit 1 - reverse face scars 20-29, obverse face scars 1-10.
2.1	Edge Sharpness		sharp	
2.2	Margin Damage		light	
2.3	Microflakes		light	
2.4	Proximal Edge Morphology		straight and U-shaped notches	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	0		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	rounded	rounded straight	
5.2	Scar Termination at Distal Edge	feather	feather/ step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R26, C02070

	Prehistoric C02070 Scar R26	AB3-17 Mod. Perc. Shape Hammerstone	AB15-18(a) Mod. Perc. Shape Billet	AB8-6 Sub. Press. Thin P.F.
1.1	moderate	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 85.72 - 14.28	+ 1
3.2	gradual	+ 1	+ 80 - 20	+ 1
3.3	thin	+ 1	+ 85.12 - 14.28	+ 1
4.1	0	+ 33.3 - 66.7	+ 85.72 - 14.28	+ 50 - 50
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	0	+ 66.7 - 33.3	+ 85.72 - 14.28	+ 75 - 25

5.1	straight		+ 1	+ 57.1 - 42.9 + 42.9 - 57.1	+ 25 - 75 + 75 - 25
5.2	feather		+ 33.3 - 66.7	+ 71.4 - 28.6	+ 75 - 25
Total		+	+ 6.33	+ 6.51	+ 6.25
		-	- 1.67	- 1.49	- 1.75
%		+	+ 79	+ 81	+ 78
		-	- 21	- 19	- 22
Score			+ 58	+ 62	+ 56

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 58 - Moderate Percussion Shape Hammerstone

This is a shaping flake, and due to the presence of other hammerstone percussion on both faces the hammerstone behavior unit is selected, although the scores are very close. There is a possibility it could be a substantial pressure flake.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02070, Edge Unit 1 (coded on Scar R26)

	Prehistoric C02070 Edge Unit 1	AB2-2(b) Min. Press. Rub P.F.	AB2-2(c) Min. Platform Isolating P.F.	AB14-16(b) Min. Perc. Shape Hammer.	AB13-15 Min. Press. Shape P.F.	AB6-13(a) Min. Shear Shape P.F.
1.1	minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	sharp	+ 1	+ 1	+ 16.7 - 83.3	+ 1	+ 33.3 - 66.7
2.2	light	- 1	- 1	- 1	+ 18.75 - 81.25	+ 16.7 _ 83.3
2.3	light	- 1	+ 42.85 - 57.15	- 1	- 1	- 1
2.4	U-shaped notches and some straight	+ 1	+ 1	+ 1	+ 1	- 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	rounded & straight	+ 1	+ 86 - 14	+ 1	+ 1	+ 50 - 50
5.2	feather/ step	+ 1	+ 1	+ 1	+ 1	+ 50 - 50
Total	+	+ 5	+ 5.29	+ 4.17	+ 5.19	+ 2.50
	-	- 2	- 1.71	- 2.83	- 1.81	- 4.50
%	+	+ 71	+ 76	+ 60	+ 74	+ 36
	-	- 29	- 24	- 40	- 26	- 64
Score		+ 42	+ 52	+ 20	+ 48	- 28

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 52 - Min. Platform isolating with P.F. and
Possible + 42 - Min. Press. Rub with P.F.

Both of the above units are present as part of edge unit # 1 (the platform isolating is on the obverse face).

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact, C02070 (Jessup)

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
015		Highly Probable	+ 68	Mod./Sub. Perc. Thin Hammerstone	AB16-7(a)
	Edge Unit 2	Highly Probable	+ 82	Min. Pressure Shape with Pressure Flaker	AB13-15
019		Possible	+ 44	Substantial Pressure Thin with Pressure Flaker	AB8-6
-	Edge Unit 3	Possible	+ 66	Min. Press Rub/P.F.	AB2-2(b)
R7		Possible Possible	+ 57 + 44	Sub./Mod. Perc. Thin with Hammerstone Sub. Press. Thin with P.F.	AB16-7(a) AB8-6
R8		Possible	+ 60	Mod./Sub. Perc. Thin with Hammerstone	AB16-7(a)
R26		Possible	+ 58	Moderate Percussion Shape Hammerstone	AB3-17
	Edge Unit 1	Possible Possible	+ 52 + 42	Min. Platform Isolating with P.F. Min. Pressure Rub with P.F.	AB2-2(c) AB2-2(b)

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units:

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Moderate to Substantial Percussion Thin with Hammerstone: Face paring removes flakes which are a minimum of twice the size of the paltform at the artifact edge which has the effect of thinning the specimen rather than moving in the overall outline shape or outer edge. Production Unit Code is 40:4, 51, 41.

(b) Moderate Percussion Shape with Hammerstone: These flakes differ from the larger hammerstone face paring flakes in that they are used to control the overall shape of the specimen during the reduction process through margin moving. Production Unit Code is 33:3, 42, 41. In some cases the margin moving may have been used to prepare solid platforms on the edge for further substantial face paring.

3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

(a) Minimum Pressure Shape with Pressure Flaker: These margin moving flakes were used on the base (scars R12 to R18) to shape the convex base. Production Unit Code is 33:2, 32, 31.

(b) Minimum, Moderate and Substantial Pressure Thin with Pressure Flaker: These units were used for face paring and margin contouring (on the tip) to thin the edge angle. Production Unit Codes are 40:2/3/4, 41, 31 and 31:2, 41, 31 (on tip).

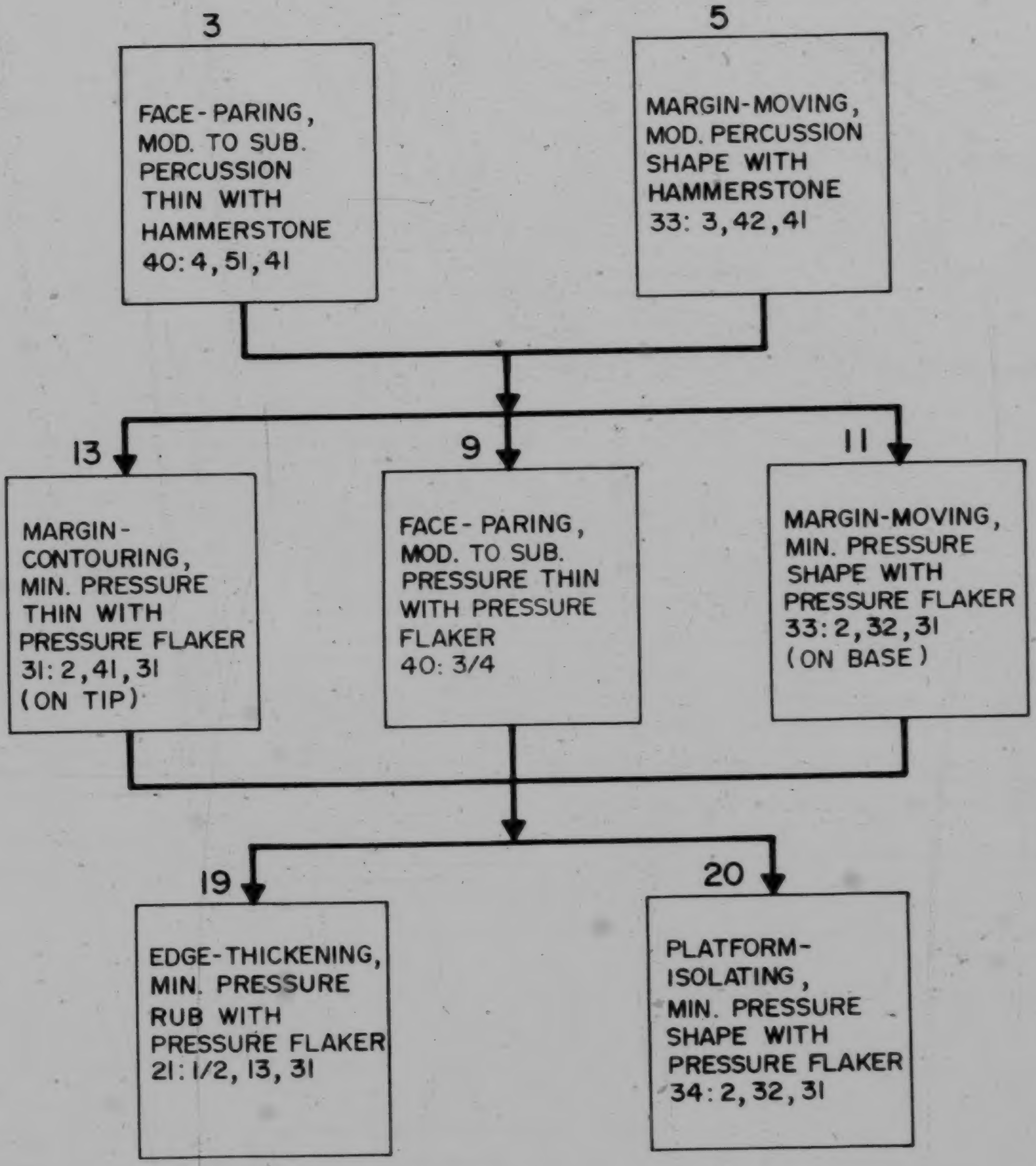
3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

(a) Minimum Platform Isolating with Pressure Flaker: This unit may be present on scars 03, 04, 05, and 06 as they most closely resemble the experimental morphology [see experiment AB2-2(c)]. Platform isolating consists of removing small notches on either side of an edge area to be used as a platform for a thinning flake. By isolating the platform in this way, the thinning flake tends to travel inwards further in a more confined scar pattern rather than spreading out. Production Unit Code is 34:2, 32, 31.

(b) Minimum Pressure Rub with Pressure Flaker: This edge unit is present and has dulled the edge of all of edge unit #3 and the lower portion of edge unit #1 and perhaps, to a very minimal extent, the base (edge unit 2). This behavior unit thickens and strengthens the edge and allows for the edge to be more effectively used as a platform for further flake removals. Production Unit Code is 21:1/2, 13, 31.

(b) Reconstructing Sequencing of Production Units: C02070

3.4 Flow Diagram of Production Units (below)


3
FACE-PARING, MOD. TO SUB. PERCUSSION THIN WITH HAMMERSTONE 40: 4, 51, 41
5
MARGIN-MOVING, MOD. PERCUSSION SHAPE WITH HAMMERSTONE 33: 3, 42, 41
13
MARGIN-CONTOURING, MIN. PRESSURE THIN WITH PRESSURE FLAKER 31: 2, 41, 31 (ON TIP)
9
FACE-PARING, MOD. TO SUB. PRESSURE THIN WITH PRESSURE FLAKER 40: 3/4
11
MARGIN-MOVING, MIN. PRESSURE SHAPE WITH PRESSURE FLAKER 33: 2, 32, 31 (ON BASE)
19
EDGE-THICKENING, MIN. PRESSURE RUB WITH PRESSURE FLAKER 21: 1/2, 13, 31
20
PLATFORM-ISOLATING, MIN. PRESSURE SHAPE WITH PRESSURE FLAKER 34: 2, 32, 31

3.5 Description and Discussion of Technological Grammar Found on Artifact

Manufactured from a flake core, this artifact still has the original flake core platform intact on the obverse face (see scar 013) and several original flake core surfaces remain, namely scars 030, 031, 032 and R25. The core was face pared using moderate to substantial percussion thinning flakes with a hammerstone. Shaping or margin moving was accomplished by means of moderate percussion flaking with a small pebble (small hammerstone). Some of these shaping flakes also overlap into thinning flakes and are concentrated along the right lateral margin of the obverse face and the left lateral margin of the reverse face and were used to trim the edges back and set up solid platforms. One of the thinning or shaping flake removals had excessive force or an improperly prepared platform (possibly scar 07 which is a substantial hammerstone thinning scar) and subsequently caused a bilateral transverse snap, breaking the artifact in half. Prior to this breakage and abandonment of the specimen, edge preparation work had been completed to prepare the margin for further thinning treatments. These edge units consist of a notable one in the form of minimum platform isolating with a pressure flaker. Good examples of this behavior unit are scars 03, 04, 05 and 06, showing the characteristic U-shaped notches placed on either side of a potential platform area. By isolating the platform in this way, a more compact and longer thinning flake can be detached travelling inwards rather than sideways along the margin. This helps to control the thinning process. A second edge unit was a minimum pressure rub with a pressure flaker. This unit was used to dull the edge by removing overly thin material and also helped to blunt and strengthen the edge for further flaking activity. The behavior unit is present in all of edge unit #3 and the lower portions of edge unit #1 and, as well, minimally on the base overlying edge unit 2. Edge unit 2, the final behavior unit here, comprises a minimum pressure shaping with an antler pressure flaker. The unit has been applied in one small area (scars R12 to R18) on the base of the artifact. The unit is applied unifacially to the platform of the original flake core with the obverse side being used as the platform to remove flakes on the reverse side. The purpose was to move the margin in to form a convex base.

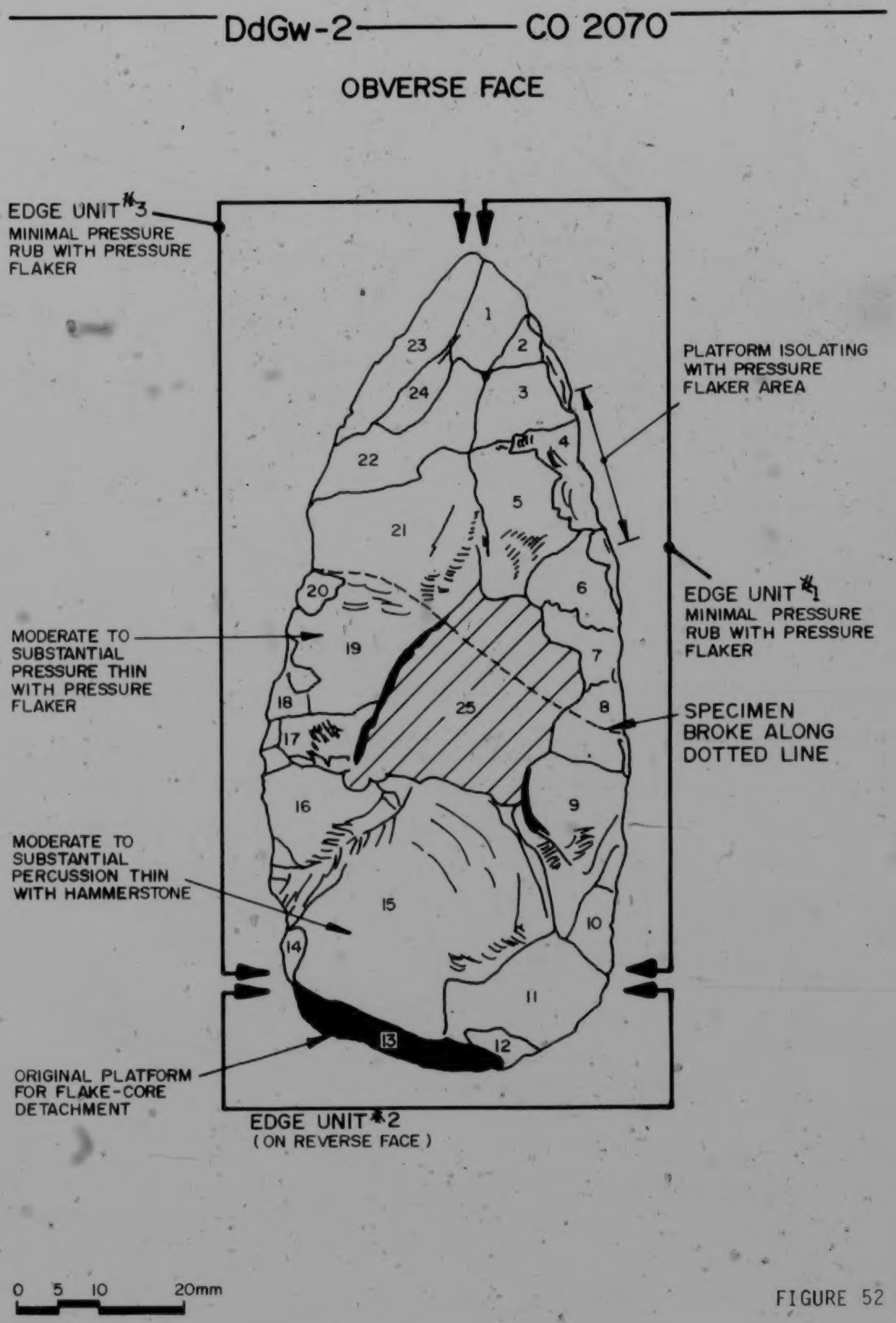

DdGw-2
CO 2070
OBVERSE FACE
EDGE UNIT #3
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
PLATFORM ISOLATING WITH PRESSURE FLAKER AREA
EDGE UNIT #1
MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
MODERATE TO SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
SPECIMEN BROKE ALONG DOTTED LINE
MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
ORIGINAL PLATFORM FOR FLAKE-CORE DETACHMENT
EDGE UNIT #2
(ON REVERSE FACE)
20mm

FIGURE 52

DdGw-2 —— CO 2070

REVERSE FACE

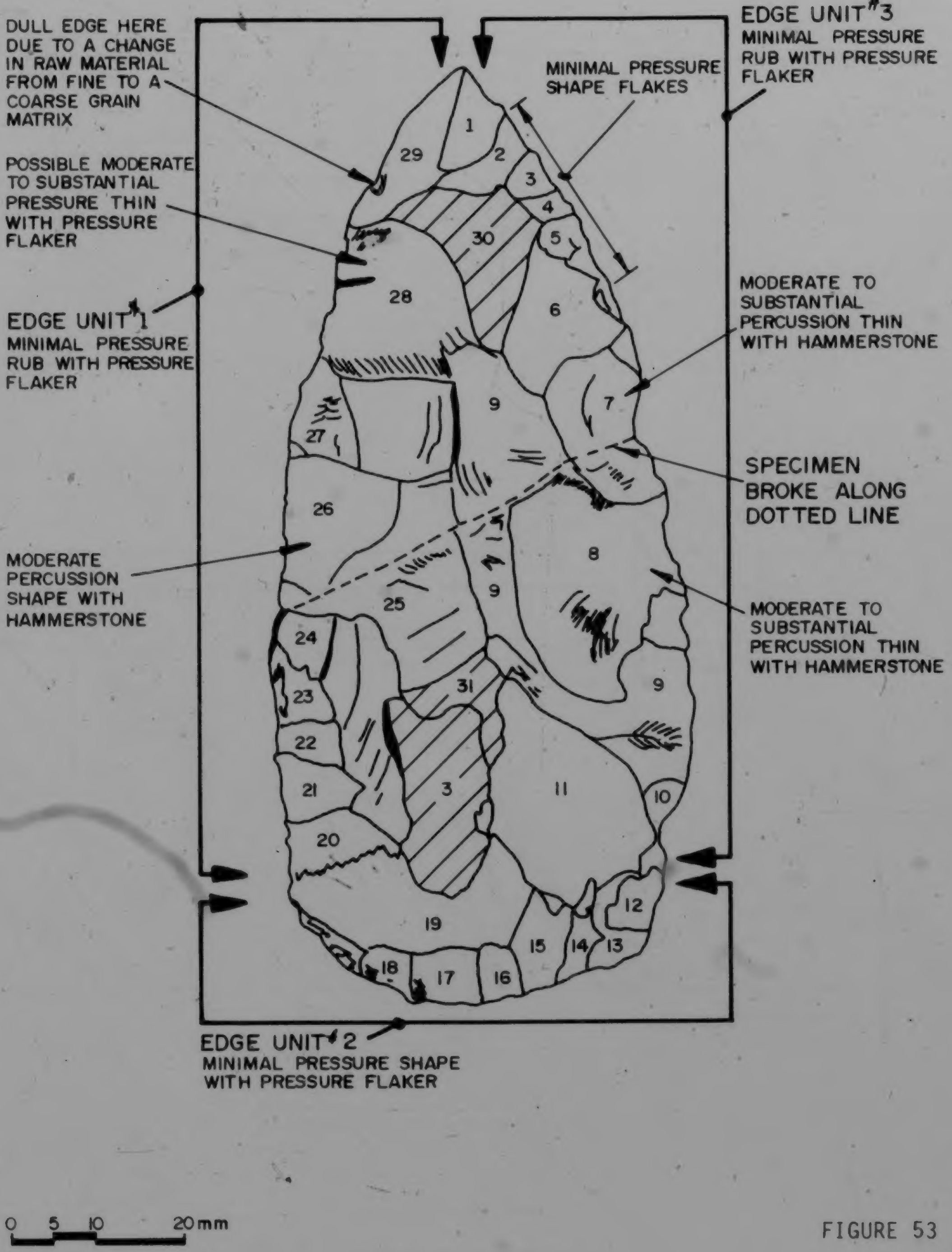

DULL EDGE HERE DUE TO A CHANGE IN RAW MATERIAL FROM FINE TO A COARSE GRAIN MATRIX
POSSIBLE MODERATE TO SUBSTANTIAL PRESSURE THIN WITH PRESSURE FLAKER
EDGE UNIT #1 MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
MODERATE PERCUSSION SHAPE WITH HAMMERSTONE
MINIMAL PRESSURE SHAPE FLAKES
EDGE UNIT #3 MINIMAL PRESSURE RUB WITH PRESSURE FLAKER
MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
SPECIMEN BROKE ALONG DOTTED LINE
MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE
EDGE UNIT #2 MINIMAL PRESSURE SHAPE WITH PRESSURE FLAKER
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
0 5 10 20mm

FIGURE 53

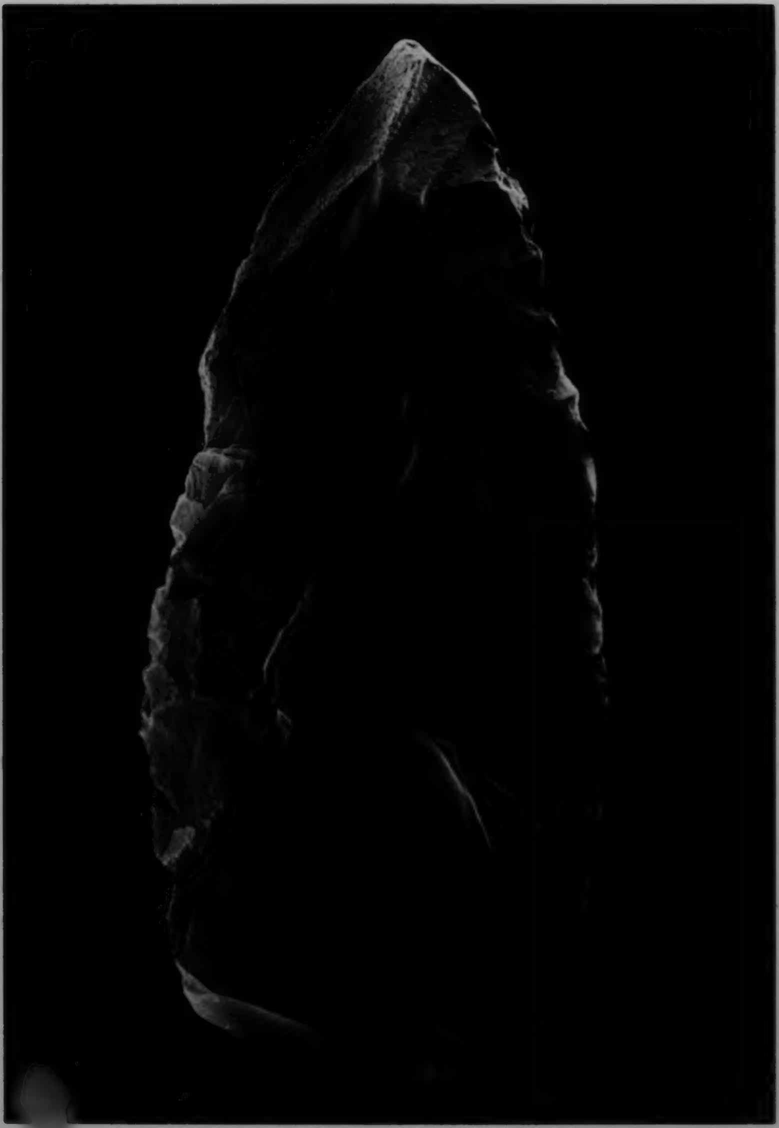


Plate 62. Prehistoric Artifact C02070, Obverse Face.

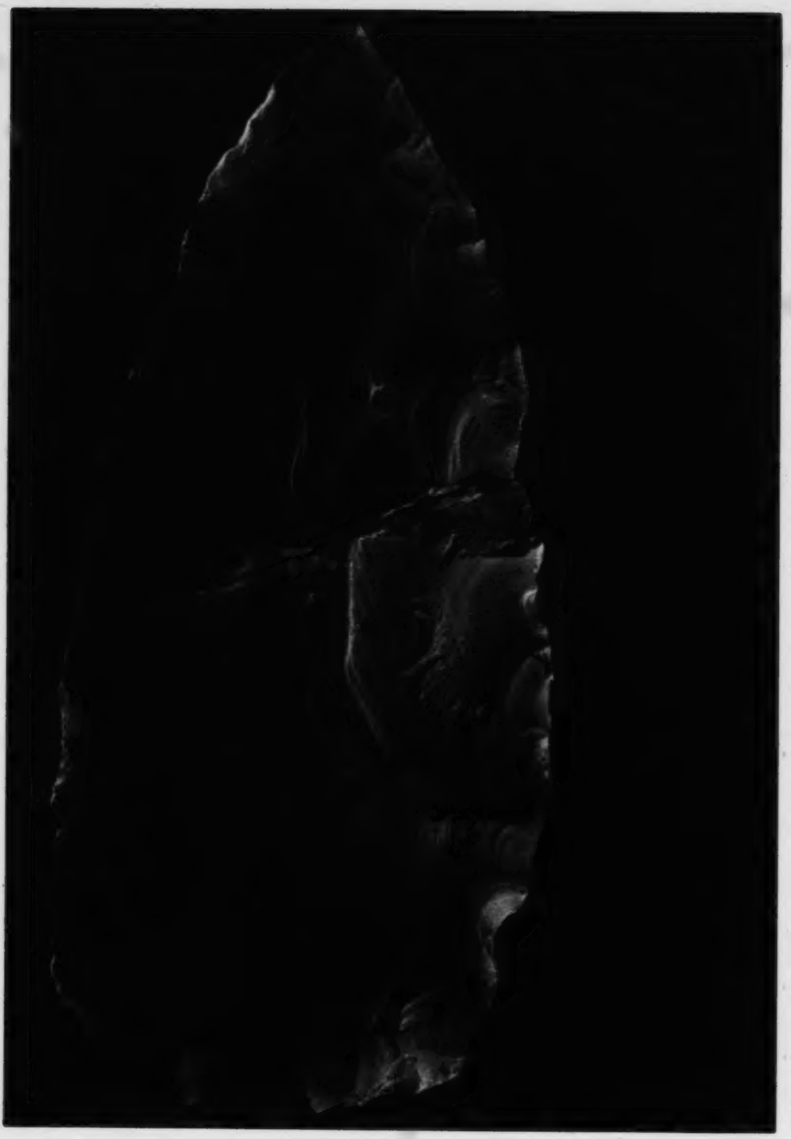


Plate 63. Prehistoric Artifact C02070, Reverse Face.

Table 69: Form for Coding and Interpreting Prehistoric Artifacts

1.0 Prehistoric Artifact Identification

1.1 Artifact Face: Obverse and Reverse

1.2 Prehistoric Specimen Provenience: DdGw-2 (Jessup Site)

1.3 Specimen Catalogue #: C02071

1.4 Photographic Plate Identification: Roll 2, B2, #21A and 27A

1.5 Standard Artifact Description:

1.6 Raw Material: Welded Tuff

1.7 Shape/Artifact Class: Biface

1.8 Flaking (Bifacial/Unifacial): Bifacial

1.9 Metric Size: length - 10.88 cm
width - 4.72 cm
thickness - 1.54 cm

1.10 Form/Morphology Description:

This is a rough preform consisting of a broad ovoid blade with a broad but shallow convex base. It is manufactured from a bifacially worked flake, with the striking platform of the flake preform still present. Unsuccessful thinning at mid section has caused a bilateral traverse fracture snapping the specimen in half. The two sections have been glued back together for analysis.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02071	Main Flake Scar # 03	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very sub. (1)	Min. or very minimal (2)	1. Because of scar size it must be substantial force.
2.1	Edge Sharpness		intermediate	
2.2	Margin Damage		light	2. All sub. perc. or indirect perc. have curved notches - this one is straight. Therefore, some form of edge treatment is present.
2.3	Microflakes		light	
2.4	Proximal Edge Morphology		straight with convex projections	
3.1	Negative Bulb of Force	indistinct		3. There is a single undulation connected with the flow of force that may be a rib or an undulation.
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thick		
4.1	Presence or Absence of Ribs	0 (3)		4. This is a failed scar because it took out too much material.
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		5. This Edge Unit (#1) covers scars 1-3, 22-23 on obverse face and scars 1-4 on the reverse face (see scar R4).
4.4	Tearing	heavy		
5.1	Scar Shape at Distal Edge	rounded	1/2 straight 1/2 curved	
5.2	Scar Termination at Distal Edge	step/ feather (4)	step/ feather	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 03, Main Scar, C02071

	Prehistoric C02071 Scar 03	AB16-17(a) Mod./Sub. Perc. Thin Hammerstone	AB11-11 Sub. Indirect Percussion	AB7-10 Sub. Perc. Thin Billet
1.1	very sub.	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 66.6 - 33.3	+ 75 - 25
3.2	gradual	+ 1	+ 1	+ 75 - 25
3.3	thick	+ 20 - 80	- 1	+ 50 - 50
4.1	0	+ 20 - 80	+ 66.7 - 33.3	+ 50 - 50
4.2	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a
4.4	heavy	- 1	- 1	- 1

5.1	rounded	+ 40 - 60	+ 33.3 - 66.7	+ 50 - 50
5.2	step/ feather	+ 1	+ 1	+ 1
Total	+	+ 4.8	+ 4.67	+ 5
	-	- 3.2	- 3.33	- 3
%	+	+ 60	+ 58	+ 63
	-	- 40	- 42	- 37
Score		+ 20	+ 16	+ 26

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Indeterminate + 20 - Mod./Sub. Perc. Thin Hammerstone

N.B.

This scar is very difficult to code as it represents a failed scar - the flatness and lack of a distinct percussion bulb favour a hammerstone identification.

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar, C02071, Edge Unit 1 (see note 5) (coded 03)

	Prehistoric C02071 Edge Unit 1	AB10-1 Min. Rub/Buffet with Hammerstone	AB10-1 Min. Rub/Buffet Antler Billet	AB6-13(a) Min. Shear Shape with P.F.	AB2-2(c) Min. Platform Isol. with P.F.	AB14-16(b) Min. Perc. Shape Hammer.
1.1	minimal to very min.	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate	+ 1	+ 15 - 85	+ 66.6 - 33.3	- 1	+ 83.3 - 16.7
2.2	light	- 1	+ 15 - 85	+ 16.7 - 83.3	- 1	- 1
2.3	light	- 1	+ 15 - 85	- 1	+ 42.85 - 57.15	- 1
2.4	straight with convex projections	+ 1	+ 1	+ 1	- 1	+ 83.3 - 16.6
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	1/2 straight 1/2 curved	+ 75 - 25	- 1	+ 50 - 50	+ 85 - 15	+ 33.3 - 66.6
5.2	step/ feather	+ 1	+ 1	+ 1	+ 1	+ 1
Total	+	+ 4.75	+ 3.45	+ 4.22	+ 3.28	+ 4
	-	- 2.25	- 3.55	- 2.67	- 3.72	- 3
%	+	+ 68	+ 49	+ 62	+ 47	+ 57
	-	- 32	- 51	- 38	- 53	- 43
Score		+ 36	- 2	+ 24	- 6	+ 14

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 36 - Min. Rub Buffet/Hammerstone

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02071	Main Flake Scar # 021	Edge Treatment on Same Scar	Notes
1.1	Scar Size	medium		
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	absent		
4.2	Distinctiveness of Ribs	n/a		
4.3	Rib Spacing And Distribution	n/a		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded		
5.2	Scar Termination at Distal Edge	feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar 021, Main Scar, C02071

	Prehistoric C02071 Scar 021	AB16-7(a) Mod./Sub. Perc. Thin Hammer.	AB3-17 Mod. Perc. Shape Hammer.	AB5-9(b) Mod. Perc. Thin with Billet	AB15-18(a) Mod. Perc. Shape/Billet
1.1	medium	+ 1	+ 1	+ 1	+ 1
2.1					
2.2					
2.3					
2.4					
3.1	indistinct	+ 1	+ 1	+ 80 - 20	+ 85.72 - 14.28
3.2	gradual	+ 1	+ 1	+ 80 - 20	+ 1
3.3	thin	+ 80 - 20	+ 1	+ 80 - 20	+ 85.72 - 14.28
4.1	absent	+ 20 - 80	+ 66.7 - 33.3	+ 80 - 20	+ 85.72 - 14.28
4.2	n/a	n/a	n/a	n/a	n/a
4.3	n/a	n/a	n/a	n/a	n/a
4.4	light	+ 40 - 60	+ 33.3 - 66.7	+ 20 - 80	+ 14.28 - 85.72

5.1	rounded	+ 40 - 60	- 1	+ 40 - 60	+ 42.9 - 57.1
5.2	feather	+ 40 - 60	+ 33.3 - 67.7	+ 50 - 50	+ 71.4 - 28.6
Total	+	+ 5.20	+ 5.33	+ 5.30	+ 5.86
	-	- 2.80	- 2.67	- 2.70	- 2.14
%	+	+ 65	+ 67	+ 66	+ 73
	-	- 35	- 33	- 34	- 27
Score		+ 30	+ 34	+ 32	+ 46

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 34 - Moderate Percussion Shape Hammerstone

The thinness and flatness of the flake scar, plus the indistinct percussion bulb, favour a hammerstone identification even though the billet scored slightly higher due to flake termination which, in this case, may be determined by the very steep working face and the smooth original flake core surface.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02071	Main Flake Scar # R4	Edge Treatment on Same Scar	Notes
1.1	Scar Size	very sub.	(2)	1. Attribute 2.1 immediately indicates overlapping technological behaviors as no sub. or mod. percussion flakes leave an intermediate sharp edge.
2.1	Edge Sharpness			
2.2	Margin Damage			
2.3	Microflakes			
2.4	Proximal Edge Morphology			2. Edge Unit 1 - scars 1-4 reverse face and 1-3, 22-23 obverse face (see scar 03).
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		3. The ribs are difficult to discern - some faint ones may be evenly distributed.
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	rel. far apart on dist. half (3)		
4.4	Tearing	0		
5.1	Scar Shape at Distal Edge	straight		
5.2	Scar Termination at Distal Edge	step/ feather		

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R4, Main Scar, C02071

	Prehistoric C02071 Main Scar R4	AB7-10 Sub. Perc. Thin Billet	AB11-11 Sub. Indirect Percussion	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone
1.1	very sub.	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 75 - 25	+ 66.6 - 33.3	+ 1
3.2	gradual	+ 75 - 25	+ 1	+ 1
3.3	thin	+ 50 - 50	+ 1	+ 80 - 20
4.1	present	+ 50 - 50	+ 33.3 - 66.7	+ 80 - 20
4.2	indistinct	+ 1	+ 1	+ 1
4.3	rel. far apart on distal 1/2	+ 1	+ 1	- 1
4.4	0	+ 75 - 25	+ 66.6 - 33.3	+ 60 - 40

5.1	straight	- 1	- 1	+ 60 - 40
5.2	step/ feather	+ 1	+ 1	+ 1
Total	+	+ 7.25	+ 7.67	+ 7.80
	-	- 2.75	- 2.33	- 2.20
%	+	+ 73	+ 77	+ 78
	-	- 27	- 23	- 22
Score		+ 46	+ 54	+ 56

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 56 - Mod./Sub. Perc. Thin Hammerstone

If the rib attribute (which is doubtful) were removed, the hammerstone score would be much higher again then the billet.

2.0 Coding and Identification of Technological Attribute States Found on Individual Flake Scar(s)

2.1 Scar Coding Form for Individual Flake Scars

	Artifact # C02071	Main Flake Scar # R10	Edge Treatment on Same Scar	Notes
1.1	Scar Size	substantial	very minimal (1)	1. Edge Unit 2 coded from scars 8-12 reverse face and 9-20 obverse face (see scar 0-18)
2.1	Edge Sharpness		intermediate to dull	
2.2	Margin Damage		heavy	
2.3	Microflakes		heavy	
2.4	Proximal Edge Morphology		straight with convex projections	
3.1	Negative Bulb of Force	indistinct		
3.2	Bulb to Scar Transition Angle	gradual		
3.3	Flake Thickness	thin		
4.1	Presence or Absence of Ribs	present		
4.2	Distinctiveness of Ribs	indistinct		
4.3	Rib Spacing And Distribution	far apart on distal 1/2		
4.4	Tearing	light		
5.1	Scar Shape at Distal Edge	rounded	straight	
5.2	Scar Termination at Distal Edge	feather	step	

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R10, C02071

	Prehistoric C02071 Scar R10	AB16-7(a) Mod./Sub. Perc. Thin Hammerstone	AB7-10 Sub. Perc. Thin/Billet	AB11-11 Sub. Indirect Percussion
1.1	substantial	+ 1	+ 1	+ 1
2.1				
2.2				
2.3				
2.4				
3.1	indistinct	+ 1	+ 75 - 25	+ 66.7 - 33.3
3.2	gradual	+ 1	+ 75 - 25	+ 1
3.3	thin	+ 80 - 20	+ 50 - 50	+ 1
4.1	present	+ 80 - 20	+ 50 - 50	+ 33.3 - 66.7
4.2	indistinct	+ 1	+ 1	+ 1
4.3	far apart evenly dist.	+ 1	- 1	+ 1
4.4	light	+ 40 - 60	+ 25 - 75	+ 33.3 - 66.7

5.1	rounded	+ 40 - 60	+ 50 - 50	+ 33.3 - 66.7
5.2	feather	+ 40 - 60	+ 25 - 75	+ 1
Total	+	+ 7.80	+ 5.50	+ 7.67
	-	- 2.20	- 4.50	- 2.33
%	+	+ 78	+ 55	+ 77
	-	- 22	- 45	- 23
Score		+ 56	+ 10	+ 54

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

Possible + 56 - Mod./Sub. Perc. Thin Hammerstone

2.2 Interpretation of Individual Flake Scar(s) in Terms of Behavior Units (Morpho-Units) Responsible for Flake Scar R10, C02071, Edge Unit #2

	Prehistoric C02071 Edge Unit #2	AB14-16(b) Min. Perc. Shape Hammer.	AB6-13(a) Min. Shear Shape with P.F.	AB6-13(b) Mod. Shear Shape with P.F.	AB2-2(b) Min. Press. Rub with P.F.	AB10-1(a) Min. Rub/Buffet Hammerstone
1.1	very minimal	+ 1	+ 1	+ 1	+ 1	+ 1
2.1	intermediate to dull	+ 83.3 - 16.7	+ 66.7 - 33.3	- 1	- 1	+ 1
2.2	heavy	+ 1	- 1	+ 1	+ 1	+ 1
2.3	heavy	- 1	+ 66.7 - 33.3	+ 1	+ 1	- 1
2.4	straight with convex project.	+ 83.3 - 16.6	+ 1	+ 1	+ 84 - 16	+ 1
3.1						
3.2						
3.3						
4.1						
4.2						
4.3						
4.4						

5.1	straight	+ 33.3 - 66.7	+ 50 - 50	+ 44 - 56	+ 50 - 50	+ 50 - 50
5.2	step	+ 33.3 - 66.7	- 1	+ 22.3 - 77.7	+ 50 - 50	+ 50 - 50
Total	+	+ 4.33	+ 3.83	+ 4.66	+ 4.84	+ 5
	-	- 2.67	- 3.17	- 2.34	- 2.16	- 2
%	+	+ 62	+ 55	+ 67	+ 69	+ 71
	-	- 38	- 45	- 33	- 31	- 29
Score		+ 24	+ 10	+ 34	+ 38	+ 42

2.3 Behavior or Morpho-Unit Alternative Chosen from Above:

* Possible + 42 - Min. Rub/Buffet Hammerstone
Possible + 38 - Min. Pressure Rub with P.F.
Possible + 34 - Mod. Shear Shape with P.F.

* Rub/buffet produces the flat little scars found on the specimen. As well, the min. rub/buffet with hammerstone was used on the other edge unit (#1).

2.4 Summary of Behavior Units (Morpho-Units) Identified on Artifact C02071

Main Scar #	Edge Unit Scar #	Rating on Scoring Scale	Final +/- Score	Behavior Unit	Experimental Control Specimen
03		Indeterminate	+ 20	Mod./Sub. Percussion Thin Hammerstone (represents a failed scar)	AB16-17(a)
	Edge Unit 1	Possible	+ 36	Min. Rub Buffet Hammerstone	AB10-1
021		Possible	+ 34	Mod. Perc. Shape Hammerstone	AB3-17
R4		Possible	+ 56	Mod./Sub. Perc. Thin Hammerstone	AB16-7(a)
R10		Possible	+ 56	Mod./Sub. Perc. Thin Hammerstone	AB16-7(a)
R10	Edge Unit 2	Possible	+ 42	Min. Rub/Buffet Hammerstone	AB10-1(a)

3.0 Interpretation of Behavior (Technological) Units

(a) Transforming Behavior Units into Production Units:

3.1 Function of Percussion Thinning/Shaping Units (moderate to very substantial size scars on specimen)

(a) Moderate Percussion Shape Hammerstone: This margin moving unit was used to shape the edge, probably with a small hammerstone. Flake scar 021 is an example. Production Unit Code is 33:3, 42, 41.

(b) Substantial/Moderate Percussion Thin with Hammerstone: This behavior unit was used to thin the specimen. Biface thinning or face paring is designed to remove face material rather than alter the outline form of the artifact. Production Unit Code is 40:3/4, 41, 41.

3.2 Function of Pressure Thinning/Shaping Units (minimal to substantial size scars on specimen)

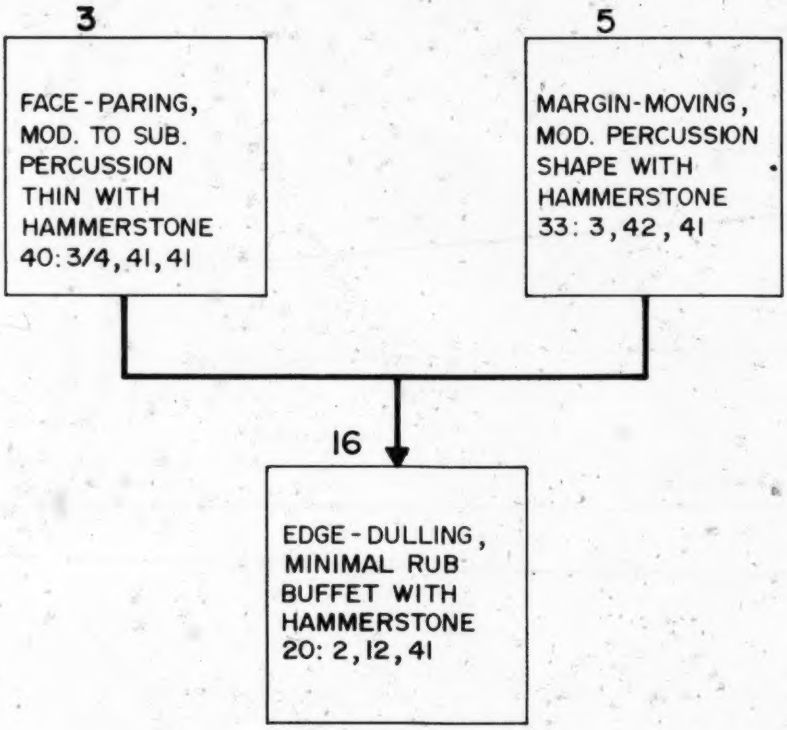
There are no pressure units on this specimen.

3.3 Function of Edge Units (minimal to very minimal size scars on specimen)

(a) Minimum Rub/Buffet with Hammerstone: The rub/buffet behavior unit involves a unifacial rubbing of the edge while at the same time using minimal force to drag or bite into the edge. This results in very small flat flake removals and rounds or blunts the edge so it has an intermediate degree of sharpness between sharp and dull. Such an edge is strengthened and smoothed and is more suitable for use as a platform for further thinning/shaping work (see edge units 1 and 2). Production Unit Code is 20:2, 12, 41.

(b) Reconstructing Sequencing of Production Units: C02071

3.4 Flow Diagram of Production Units (below)


3
FACE-PARING, MOD. TO SUB. PERCUSSION THIN WITH HAMMERSTONE 40:3/4,41,41
5
MARGIN-MOVING, MOD. PERCUSSION SHAPE WITH HAMMERSTONE 33: 3,42,41
16
EDGE-DULLING, MINIMAL RUB BUFFET WITH HAMMERSTONE 20: 2,12,41

3.5 Description and Discussion of Technological Grammar Found on Artifact

Analysis of this biface "rough out" or preform was made difficult due to the lack of scars suitable for coding and scoring. There are relatively few scars on this specimen and even fewer ones that are not severely obscured by overlapping and admixture with the original flake core surface, making precise identification of the particular scar's attributes difficult. An example would be scar #018. The termination of this scar is very difficult to define as it appears to blend in or is part of the original flake core surface.

The specimen was manufactured from a flake core as scars 023 and R1 exhibit original core surface. The original platform for the core also remains (see reverse face note on diagram). The flake core was shaped utilizing moderate hammerstone percussion shaping flakes followed by substantial/moderate hammerstone thinning in a few cases (see scars R4, R10). Each artifact face has one or more significant failed scar (i.e., 04 to 08, R5 to R6) and one of these failed thinning/shaping attempts caused a bilateral transverse fracture which broke the specimen causing it to be abandoned during this initial reduction stage. Prior to abandonment, the edges (edge units 1 & 2) were treated with a minimal rub/buffet with a hammerstone. This involves rubbing the edge of the artifact while also dragging the tool so that a very minimal amount of material is removed. This rounds or blunts the edge to an intermediate sharpness, therefore making it stronger and more suitable for a platform for further flake removals.

DdGw-2 — CO 2071

OBVERSE FACE

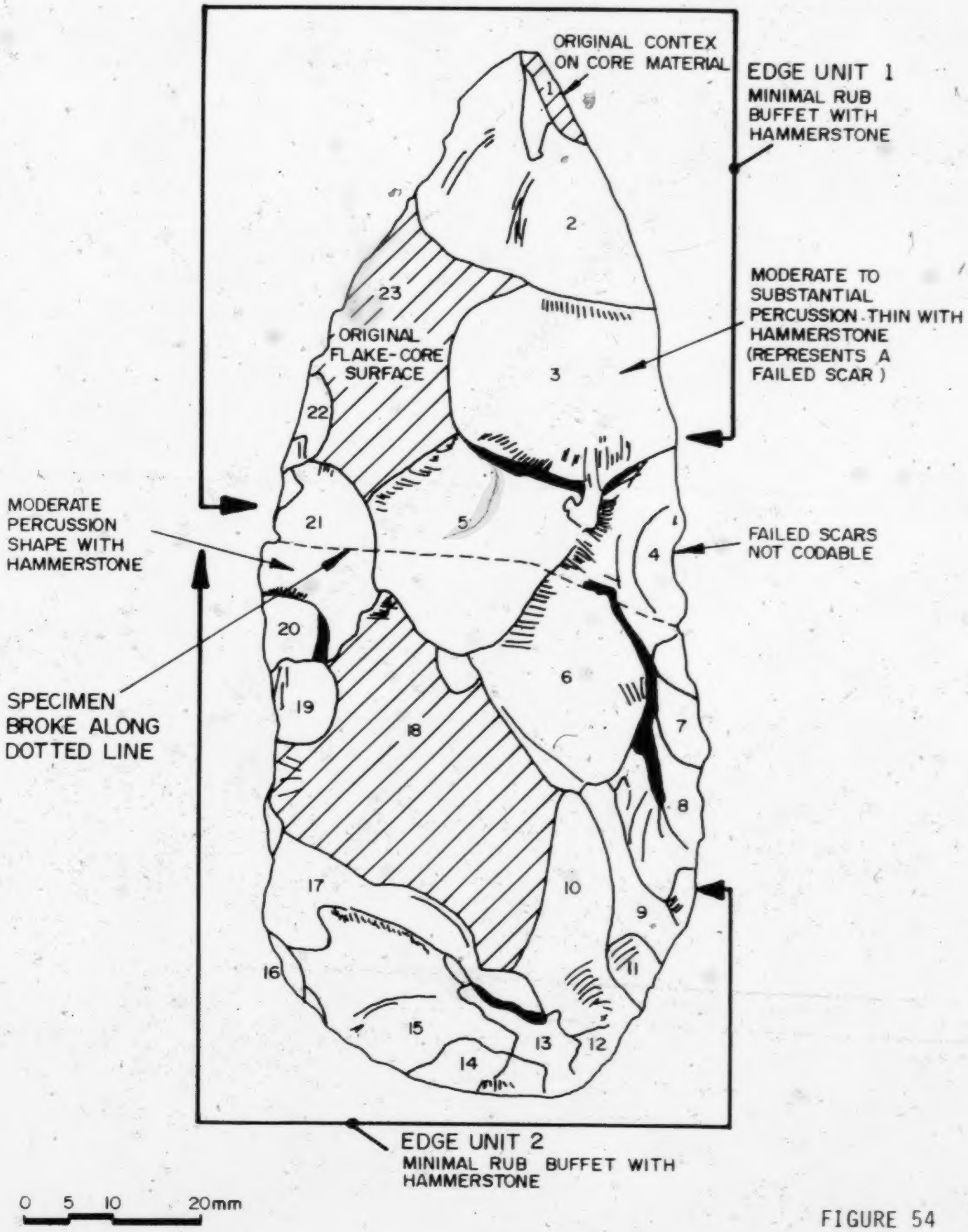
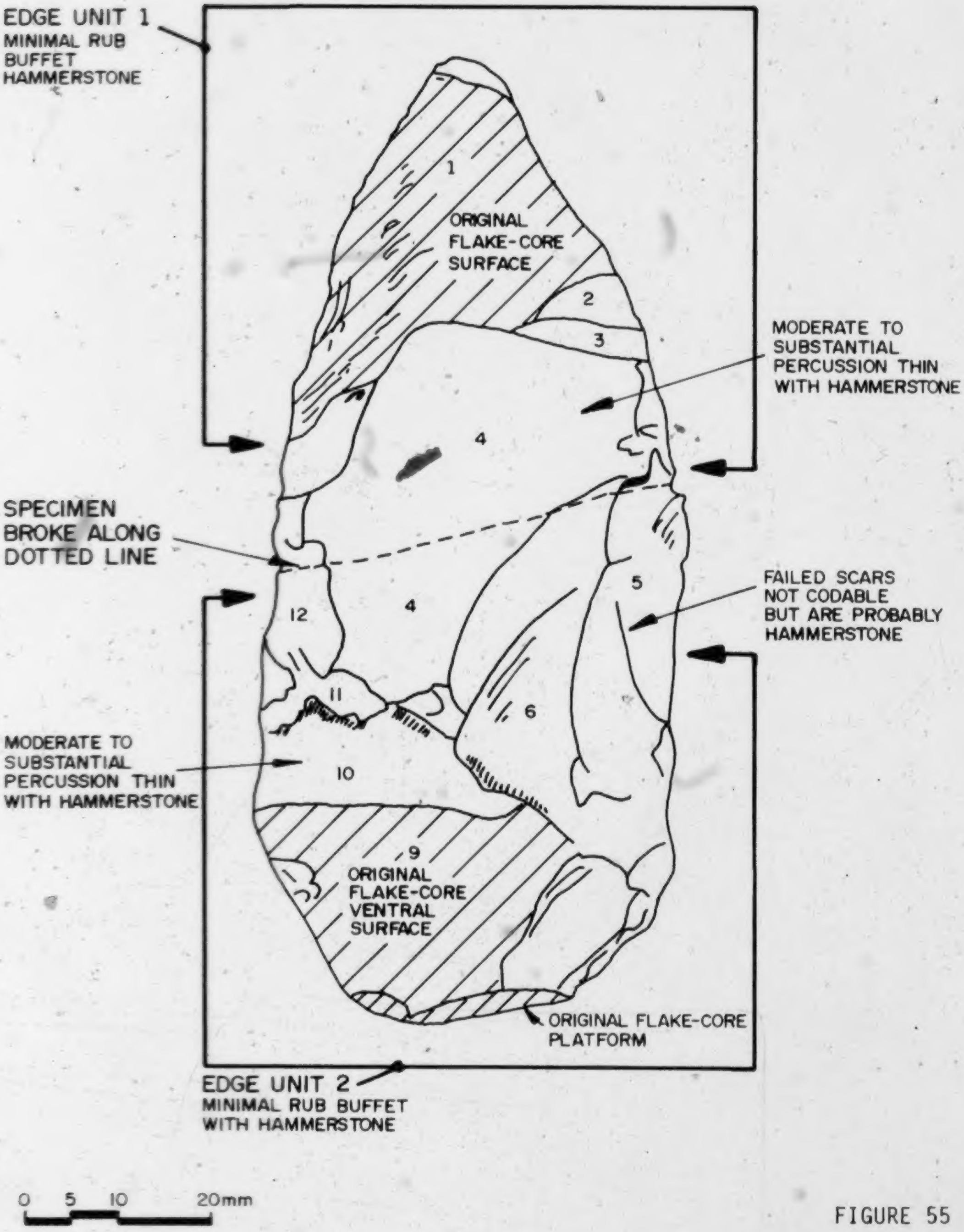

ORIGINAL CONTEX ON CORE MATERIAL
EDGE UNIT 1
MINIMAL RUB BUFFET WITH HAMMERSTONE
MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE (REPRESENTS A FAILED SCAR)
ORIGINAL FLAKE-CORE SURFACE
MODERATE PERCUSSION SHAPE WITH HAMMERSTONE
FAILED SCARS NOT CODABLE
SPECIMEN BROKE ALONG DOTTED LINE
EDGE UNIT 2
MINIMAL RUB BUFFET WITH HAMMERSTONE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
0
5
10
20mm

FIGURE 54

DdGw-2 — CO 2071

REVERSE FACE


1
ORIGINAL FLAKE-CORE SURFACE
2
3
4
4
5
6
9
ORIGINAL FLAKE-CORE VENTRAL SURFACE
10
11
12
0 5 10 20mm

EDGE UNIT 1 MINIMAL RUB BUFFET HAMMERSTONE

MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE

SPECIMEN BROKE ALONG DOTTED LINE

FAILED SCARS NOT CODABLE BUT ARE PROBABLY HAMMERSTONE

MODERATE TO SUBSTANTIAL PERCUSSION THIN WITH HAMMERSTONE

ORIGINAL FLAKE-CORE PLATFORM

EDGE UNIT 2 MINIMAL RUB BUFFET WITH HAMMERSTONE

FIGURE 55

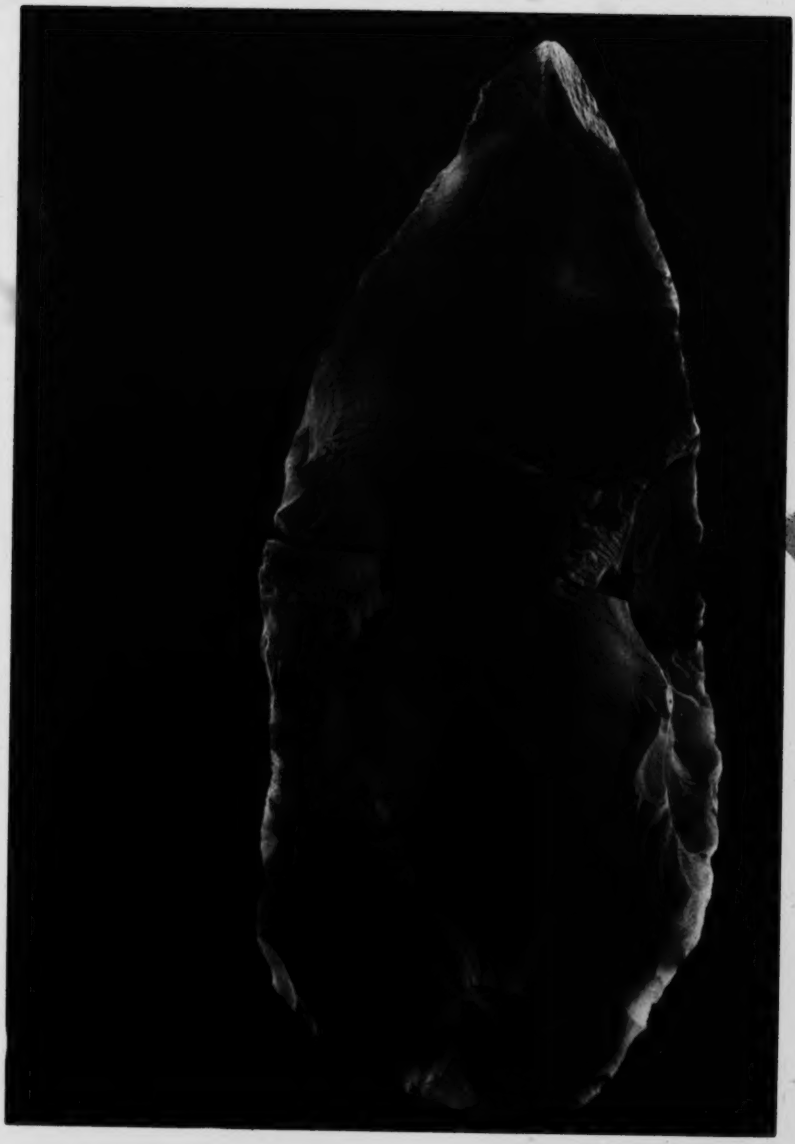


Plate 64. Prehistoric Artifact C02071, Obverse Face.

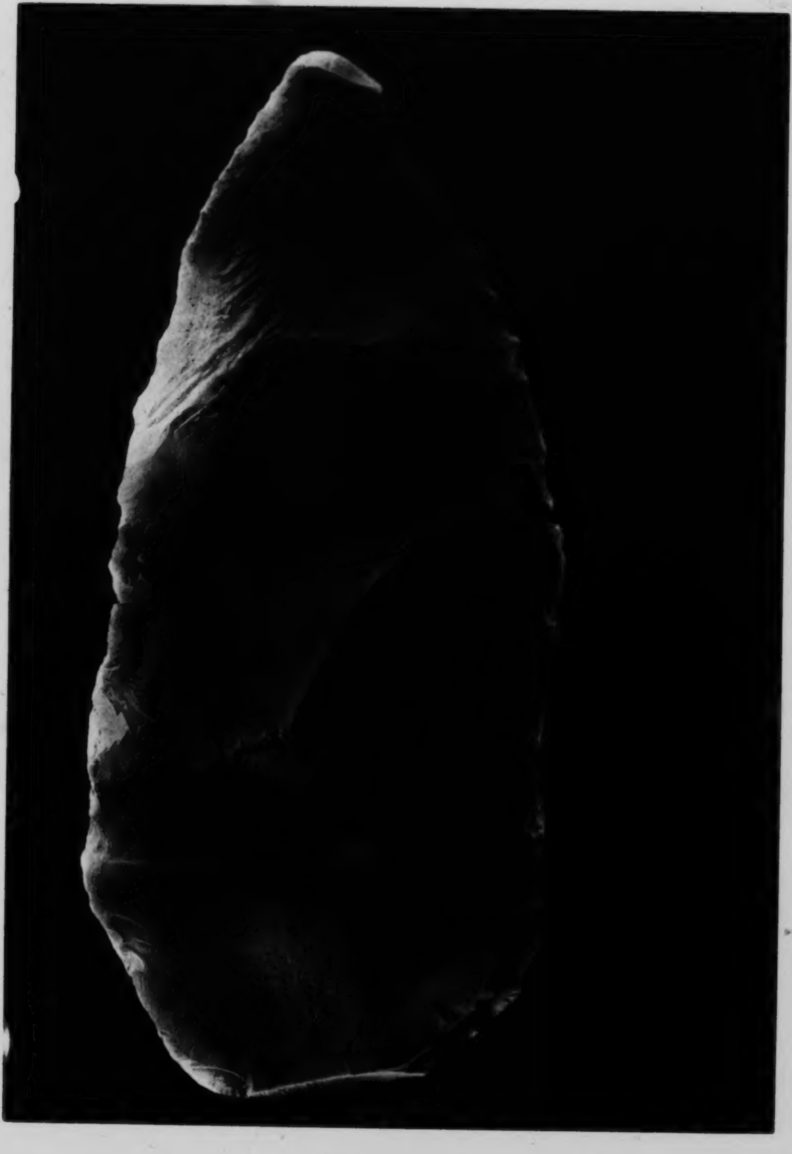


Plate 65. Prehistoric Artifact C02071, Reverse Face.